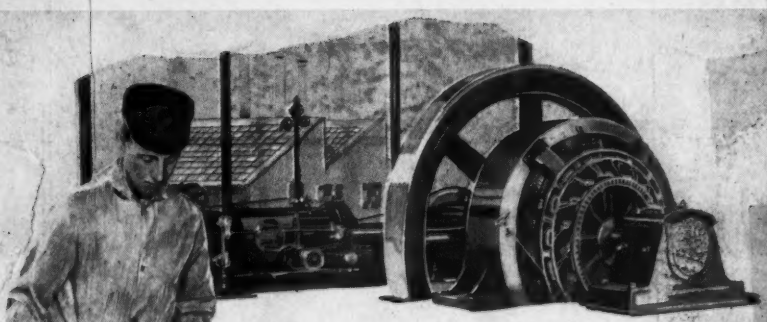
Pit and Quarry

GRAVEL · STONE

HANDLING · CRUSHING · SCREENING · WASHING



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OCTOBER, 1920

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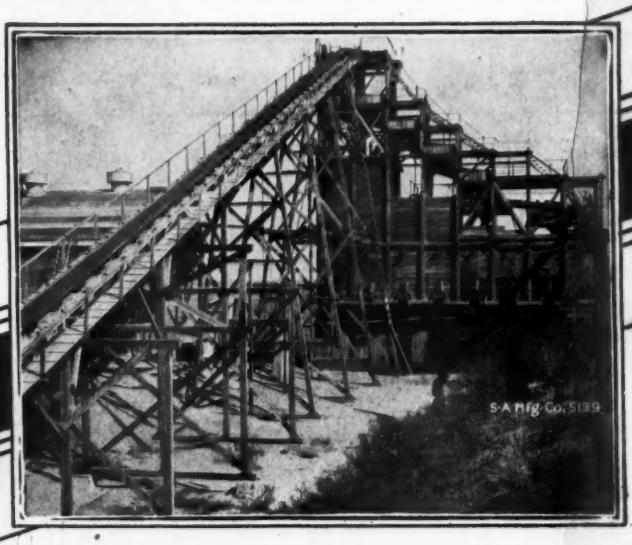
SPECIFY S-A CONVEYORS



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Pit and Quarry

A Monthly Journal for Producers of Sand, Gravel, Stone, Cement, Gypsum and Lime
Member Audit Bureau of Circulations

VOL. 5 CHICAGO, ILL., OCTOBER, 1920 NO. 1

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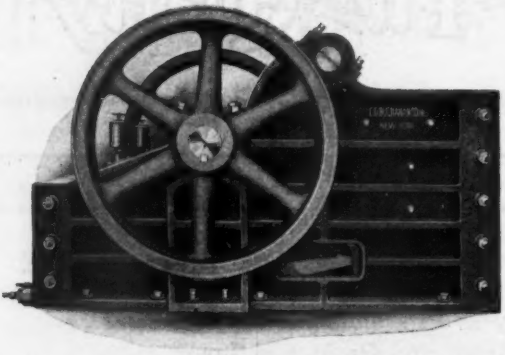
Crushers of Unusual Strength



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Pit and Quarry

Vol. 5 Chicago, Ill., October, 1920 No. 1

Electricity in Pits and Quarries

The first of a series of articles.

By DANIEL J. HAUER

A DECADE or two ago a stone crusher, an elevator and a set of screens was about all the machinery used in a quarry, while in sand and gravel pits there was little if any machinery employed, nearly all the work being done by hand methods.

Modern practice has quickly changed all of this, as the rapid development of mechanical aids has made available to the pit and quarry operator many devices materially improving the efficiency of all operators and wonderfully enlarging the scope of production. Successive improvements in the design of power driven machinery for pits and quarries have made its use much greater and this general use has made its operation the dominating factor in determining the cost of production. Hand operation cannot compete with that of machines, nor can the extent of the operation be as great.

Thus it is evident that the margin of profit to be obtained will be affected by the application of the power driven machinery. For years the majority of all machines were steam driven, with compressed air for an auxiliary, while the air power was generated by steam. Today and for some years past there has been a steadily increasing use of the electric motor, until many operations in pits and quarries, both large and small, are operated either in whole or in part by electricity.

"This consistent advance," as one writer puts it, "is the result of the growing familiarity of operators in general with the characteristics of electric service, the reliable operation insured by the simplicity, mechanical strength, and high efficiency of the modern electric motor, the co-operation of the manufacturers of such machinery in modifying the designs of their machines to utilize most effectively motor drive, and the selection of motors especially suited to the specific load conditions imposed by the varying character of the work to be performed. The most important element has, however, been the notable economies secured by numerous operators through the use of the motor drive under conditions which made it possible to calculate accurately the actual cost of different operations and compare results of electric service with those obtained in similar work in the other methods of power application.

"While there are many conditions encountered in pit and quarry work where electric power is adopted solely on the grounds of safety, flexibility, or convenience, there are, on the contrary, cases where cheap fuel or a heavy investment in serviceable equipment already provided may render the use of steam or other power preferable from an economic standpoint. The question is essentially a commercial

one, and due to the great variation in working conditions, each case must as a rule be considered as a separate problem in which the first cost of machinery, installation, operation and maintenance charges, relative efficiencies and finally the salvage values of machinery using different systems of drive, should be compared in order to determine the most suitable equipment.

"For practically all the operations in pits and quarries for excavation and other work, the electric motor constitutes the most effective medium for the application of power, especially when the machinery operated is located at a distance from the primary source of energy."

The providing of the electric power is the first consideration. In many sections of the country, even away from cities and large towns, it is now possible to purchase electric current from a central power station. This is in most cases the easiest and most economical method, yet it is surprising at times how cheaply electrical power can be developed from a nearby stream. The volume of water is not an essential, except that there must always be water during the year or working season; but the head that can be obtained is the governing factor. Even when it is not possible to get all the power needed in this way, some power can be obtained and the rest purchased. This might mean the saving of thousands of dollars per year.

With neither of these sources available it is possible to build a steam plant for the generating of electric current. The cost of such a plant varies with the amount of current needed, but there must always be a supply of fuel provided.

However, by utilizing power from a central station the investment of capital is materially reduced, being limited to purchase and installation to motors, the running of feed wires and building of a sub-station with its necessary equipment.

The use of electrical power does away with the laying and maintenance of long lines of steam or air pipes. These are difficult to keep in order, and to prevent power being lost, and there is always danger of breakdowns. Likewise as additions are made to the systems it is a hard matter to maintain the proper pressures. Temperature affects the transmission of such power and it is expensive to make changes in these systems.

On the other hand electricity is a flexible system of transmitting power, which can be easily and rapidly extended to make changes due to the development of the pit and quarry. Then, too, the electrical transmission lines are not affected by the viccissitudes of the weather, nor are the power losses likely to be as great as with other kinds of power, especially when the distances are great. Likewise these power lines, as contrasted with pipe lines, are not so likely to be injured from blasting or accidental causes, and even should they be injured or broken the service is not interrupted very long, for the wires are easily and quickly repaired.

Another advantage of electric power is that the motors are simple yet reliable in their operation, so that it is not as expensive to obtain operators as it is for steam, as the control of the motor can be entrusted to workmen of but average intelligence. Although motors must be lubricated, yet it is not necessary to have expensive lubricating devices and much money is saved in the use of packing for chests, pistons, pipe joints, etc.

Some years ago in operating certain types of large machines in such hard work as excavation, electrically operated machines were at a disadvantage as compared to steam, for there was nothing to take up recoil as there is in steam and air, so that such ma-

chines were injured themselves; but this difficulty has been effectively overcome.

Electric driven machines are usually much lighter than steam driven, so that in either pits or quarries, these are much more easily moved from one place to another, a decided advantage.

Both time and chance of accident are saved by electricity over steam, due to escaping steam, exhausts and smoke interfering with the men and their sight.

Electricity possesses a great advantage over steam for the intermittent use of machines, for they are ready for instant use by turning on a switch or control, while fires for steam must be banked and started again or else much coal is wasted if fires are kept going when they are not needed.

The use of electricity for different types of machines will be discussed in succeeding articles.

Plant Charges and Profit and Loss

IN SMALL operations of both quarries and sand and gravel pits it is more than likely that when production is going on, all the plant is in operation. When such is the case, the plant charge, including both interest and depreciation, is an overhead charge strictly against production. This charge can be applied monthly, weekly, or daily, so as to obtain the total cost of production.

But there are times when all the charges for plant should not be charged directly against production. Thus if there are units of a plant that are not in use for weeks, due to shortage in cars or a lack of orders; or that possibly an entire quarry or pit plant, being one of a number owned by a company, may be idle due to a dull season—it is manifestly wrong to charge the interest and depreciation on such a plant against the production actually made in the same operation or in the other operations.

To do this counts against the economical management of a plant or series of plants. For instance, a manager is being paid a salary and a percentage of the profits of the plant he operates. His plant charge—that is, plant actually in use—is 5 cents per ton, while if a charge is made for idle plant it would figure 8 cents per ton. This 3 cents is decidedly an injustice to the manager.

It is the part of good bookkeeping to show under "plant" this charge; but instead of charging it directly against production, it should be charged to profit and loss. In the end it will show against the season or the year's business, but it may save much confusion and even be a means of saving money in the future.

If the charge is made directly against the plant, it may be that for years such a charge may seem reasonable, but if it goes to profit and loss and this charge continues for months or years then it is evident that there is on hand more plants than needed, and steps will be taken to dispose of the extra plant.

This would mean the elimination of the profit and loss account. If there should be any chance of the peak load in production occurring again in a few seasons or years, it would be unwise to sell; instead, bear the temporary loss and have the plant for increased future production.

The profit and loss account is the real barometer of any business, while an overhead charge, figured in with a profit, may hide a loss that should be stopped.

The Regal Blue Marble Company, Regal, N. C., recently incorporated with a capital of $300,000, is planning for extensive production operations in this section. The company is headed by R. L. Harris, Murphy, N. C.; W. M. Harris, Hampton, Ga.; and H. L. Niles, Atlanta, Ga.

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Calculating Loads on Scows

By DANIEL J. HAUER

GRAVEL, sand and stone are frequently loaded upon harbor scows or barges for delivery. In some cases these scows are run under some unloading device, as a derrick or crane with a grab bucket, and rehandled either through bins or else directly onto wagons or trucks for city delivery. The material is then weighed and sold by the ton. In other cases the materials are first weighed and then loaded onto scows.

But at times there is no ready means of weighing the material either in loading or unloading, and it becomes necessary to sell the material by the cubic yard. Then the contents of the load must be measured and calculated.

The principles of calculating such loads are those laid down in solid geometry. Irregular loaded scows are much more difficult to calculate than those loaded in the shape of exact geometrical figures. There are no arbitrary rules laid down in any port or harbor for measuring and estimating loaded scows, but in some harbors it is the custom to have a man or tender on a scow, and as the scow is being towed it is customary for this man to trim the load. This puts it in some regular shape so that it is easily measured and calculated. Whenever possible the scow should always be measured in the presence of a representative of both the seller and buyer; then no disputes can arise.

It is not possible to measure one scow and then because other scows look similar when loaded, say each contains the same number of cubic yards; for the variation of a foot or even 6 inches in some measurements may mean a difference of a large number of cubic yards.

There is nothing difficult in measuring the area of the floor of the scow that may be covered, but it is difficult at times to measure the height or depth of the material. This can be done very accurately with a simple device which is shown in the accompanying cut, Fig. 1. The upright is a rod with graduations on it of feet and tenths of a foot. A metal ferrule that is fastened to one end of the cross straight edge with a level bulb on the top edge, slips up and down on the rod. The level bulb when held by one man tells when the straight edge is level, and the second man holding the rod reads the height indicated by the bottom of the ferrule.

The rod is graduated in tenths, for it is much easier to make the calculations in feet and tenths than in feet and inches.

A scow loaded with sand is much easier trimmed than one loaded with stone. In Fig. 2 is shown a loaded sand scow. The floor measures 90x25 feet. The side boards of the scow are 1.5 feet or 1 foot 6 inches high. The average height of the sand is 3.2 feet. The measurements of the top rectangle on the sand are 84x19 feet.

The rule is to obtain the top area and bottom area, add these two to-

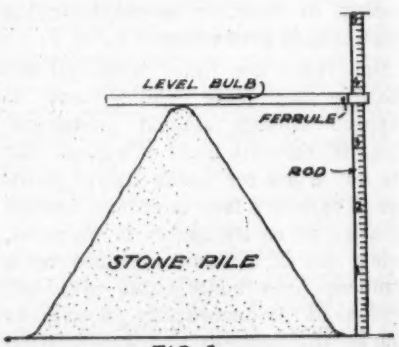


FIG. 1
SHOWING MEASURING ROD

gether and divide by two to get the mean area. This mean area is multiplied by the height, the result being the number of cubic feet, and dividing this by 27 gives the number of cubic yards.

Thus $90 \times 25 = 2250$. $84 \times 19 = 1596$. The sum of these two results equals 3846. This divided by 2 gives the mean area of 1923. The mean area multiplied by 3.2, the height, gives

FIG. 2
SCOW LOADED WITH SAND

6153.6 cubic feet, while this divided by 27 gives the result of 227.9 cubic yards.

The same scow loaded with crushed stone may be loaded from a chute or bin in three piles as shown in Fig. 3. These piles have naturally taken the shape of cones, so they need no trimming.

The rule for calculating the contents of a cone is to multiply the area of the base or bottom of the pile by its height and divide by three. This gives the number of cubic feet in the pile, so that if the result is divided by 27 the number of cubic yards are obtained.

As the base of the cone is a circle the rule for calculating the circle must be known. The radius of the circle is half the diameter. As the scow is 25 feet wide and the cone takes up all the width, the diameter of the cone is 25 feet the radius being 12.5 feet. The area of the circle is the square of the radius multiplied by the constant 3.141.

Thus the square of 12.5 equals 156.25. This multiplied by the constant 3.141 equals 490.78, which is the area of the base of the cone. This area for Cone No. 1, multiplied by the height 5 feet gives 2453.90, and divided by 3 gives as the contents of the cone 817.96 cubic feet. This divided by 27 equals 30.3 cubic yards.

Cone No. 2 has the same size base but is 5.5 feet high, hence the area 490.78 multiplied by 5.5 equals 2699.29 and divided by 3 gives 899.76, the number of cubic feet which when reduced to cubic yards gives 33.3.

For Cone No. 3, the height being 6 feet, this number is used instead of 5 or 5.5, which gives the cubical contents of this cone as 36.3 cubic yards.

The sum of the three cones equals 99.9 cubic yards.

In Fig. 4 the same scow is shown loaded with rip-rap stone. In this case the scow should be trimmed so as to make it easier to calculate, without taking too many measurements.

It can be seen from the end view that the load is triangular in shape, the base of the triangle being 25 feet. If the load was trimmed the height of the triangle or its altitude would be 6.4 feet. This is obtained by adding the five heights namely 8, 6, 7, 1.5 and 9 and dividing the total by 5. Thus the load is 25x90 on the base and an average of 6.4 feet high.

The rule for calculating this is to obtain the area of the triangle (see end view), which is the base, multiplied by the height, divided by 2. Thus $25 \times 6.4 \div 2$ equals 80 square feet. This multiplied by the length of the load, gives the total number of cubic feet the scow could contain, and dividing by 27 gives the number of cubic yards. Thus 80 is multiplied by 90 and divided by 27 gives the result of 266.6 cubic yards.

Now it can be seen that at one end of the scow there is a triangle 10 feet long at one end and another 20 feet long at the other end in which there is no stone yet this has been included in the 266.6 cubic yard. Thus at each end there are triangular pyramids that must be deducted from the total given. The figure is shown in Fig. 5.

Now the base of this pyramid is a triangle 25x6.4. Then two figures are multiplied together and divided by 2 to obtain the area as was done in calculating the area of the load, giving 80 square feet. Multiply this by the altitude 20 feet in one case and 10 feet in another and divide each by 3 gives the contents of the pyramid in cubic feet. These results divided by 27 gives the number of cubic yards. Thus the large pyramid is 19.7 cubic yards while the smaller one is 9.8, a total of 29.5 cubic yards. Subtracting this from 266.6 cubic yards leaves as the net load 237.1 cubic yards.

The load that this scow carries shows that the other two scows could have been given larger loads. The methods of calculating is simple and shows that it is not necessary to guess at loads but actual measurements should be made, and calculations carried out to obtain the exact load.

In loading scows and cars other shapes come into play, but even these will be found to be geometrical figures that can be handled in a manner similar to that already explained. Pit and Quarry is ready at any time to assist its readers in solving such problems.

The Marquette Stone Products Company, located at Marquette (formerly North McGregor), Iowa, is a $100,000 corporation recently organized. Its president is John Kramer; W. F. Bickel, vice-president; J. M. Berry, secretary, and E. A. Nicholson, treasurer. The directors are J. J. Arnold, J. W. Boyle, J. J. Burke, John Kramer and J. M. Berry. This company purchased the interests of Sawvell Bros., by whom this quarry had been operated on a small scale for several years. The Marquette Company installed two crushers and equipment manufactured by the Austin Mfg. Company, beginning with a 10-car per day capacity, but as soon as additional floor space is acquired will expand to a capacity of 30 cars daily. Tests made of their stone, show it to be suitable in every respect for road construction, and is also a high-grade agricultural lime. They are located within the yard limits of the C. M. & St. P. Ry., which maintains a large terminal at that point, four divisions radiating from there in all four cardinal directions. They expect to begin operation about October 1. This company has given its name to the post-office at that place, the office of North McGregor having been discontinued and the new office of Marquette having taken its place.

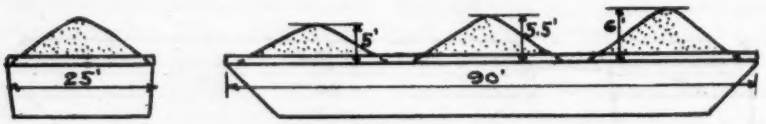


FIG. 3
SCOW LOADED WITH CRUSHED STONE.

FIG. 4
SCOW LOADED WITH RIP RAP

Extends Its Activities

Lime Association Intensifying Local and District Work

FURTHER extensions of the organization of the National Lime Association for educational publicity work have recently been made. This is in the direction of intensifying the local or district work, similar to that which has been in progress for several years in the Eastern Bureau of the Association, which embraces roughly the territory of New England, eastern New York, and the coast states as far south as Maryland.

The latest extension of the organization consists of the establishment of a central bureau in the Mississippi Valley, comprising Districts 7 and 12 of the Association, which include the states of Indiana, Illinois, Missouri, Nebraska, Colorado, Kansas, Oklahoma, Arkansas and Louisiana.

The officers of this central bureau are Col. C. W. S. Cobb, of the Glencoe Lime & Cement Co., of St. Louis, chairman, and T. P. Black of the Black White Lime Co., of Quincy, Illinois, secretary.

They will employ a permanent field man, who is a trained engineer along construction lines and qualified to deal with the chemical and agricultural uses of lime, to traverse the territory and assist in the best use of lime products in the three aspects in which it is employed, namely, in construction, in various chemical industries, and in agriculture.

A similar organization is developing in District 5 of the Association, comprising the state of Ohio. Plans are being worked out through the central office of the association for making field men representing its several technical departments available in these regional bureaus.

Few materials have a wider range of use than lime, as is illustrated by the departments of the association. More than 115 industries listed in the United States Census use this material in some of their processes. While it often does not enter into these in relatively large amounts, it is none the less necessary. To be in touch with its proper chemical, physical, and biological uses in all these fields is to span a large section of scientific knowledge and practical industry. To make these processes and uses better understood and better applied by the public is the purpose of the educational work of the National Lime Association.

Rates on Portland Cement

An order of dismissal has been made in No. 10803, Western Lime & Cement Company vs. C. B. & Q., et al., opinion No. 6333, 58 I. C. C. 508-9, the Commission holding that the rates on Portland cement from Milwaukee to various points in Wisconsin were not unreasonable. The rates complained of were on intrastate traffic during the period of federal control. In the report written by Commissioner McChord, he particularly pointed out the fact that these rates are no longer under the jurisdiction of the Commission. Mr. McChord stated that the rates under attack were generally lower than those prescribed by the Commission for application in scale II territory, as defined by it in the western cement case, supplemental report, 52 I. C. C. 225.

With a capital stock of $3,000,000 the Davenport Cement Company was incorporated under the laws of the state of Delaware recently. Their capital stock of $3,000,000 consists of preferred with a par value of $100.00, while they will also have 30,000 shares of common stock without nominal or par value. The incorporators are Messrs. E. L. Cox, of Chicago, Ill., M. E. Ochs and R. B. Cook, both of Davenport, Iowa. The office of the company within the state of Delaware is with the Corporation Trust Company of America, DuPont Building, Wilmington, Del.

Plant of Blue Ridge Talc Company, Inc., Henry, Va.

Soapstone and Talc

This New Virginia Company Is Producing Several Tons a Day

THESE snap shots were taken recently at the mill of the Blue Ridge Talc Company, Inc., Henry, Va.

This company now owns and operates the properties formerly owned by the Henry Mining Company and the Franklin Soapstone Products Corporation and control leases on about 300 acres of soapstone and talc deposits.

The mine is operated as an open quarry, being entered on the level at a point where the soapstone shows 45-foot face. The deposit extends below the level about 90 feet, but no rock is now being taken lower than the level of entrance.

Rock is all shot down and loaded in 4-yard two-way side-dump Kilbourne and Jacobs cars, by hand. Hand-loading is practiced as this class of rock must be carefully hand picked.

The loaded cars are hauled to the mill, which is located at the N. & W. Railway three-fourths mile away, on a 36-inch gauge railway by an 18-ton Porter locomotive. The crude lump rock is then dumped direct into the crusher hopper above a No. 3 Sturtevant rotary crusher, dried in a Fuller-Lehigh indirect fired rotary dryer and delivered into bins of 140 tons' capacity over two 42-inch Fuller-Lehigh pulverizers. These pulverizers have a capacity of about 6 tons per hour of 150-mesh talc, or 5 tons of 200-mesh talc.

The finished material is bagged in 80-pound paper or 100-pound burlap bags on a Bates valve bagging machine.

Storage for bagged material is now being completed and storage for the crude stone as it comes from the mine is also being erected. The crude rock storage will hold about 3,000 tons and is being so constructed that the side-dump cars will enter the center of the building, dumping either way. Directly under this track will be located

a belt conveyor to reclaim the rock and deliver to the crusher. This storage building will not only provide storage but will be used to air dry the stored rock.

Until Further Notice

Preferential Car Service to Coal Mines to Continue Indefinitely

SERVICE Order No. 15 (applying east of the Mississippi River), issued by the Interstate Commerce Commission on September 16, extends until further notice the provisions of Service Orders Nos. 7 and 9, granting preferential open top car supply to the coal mines.

Permission is given, as in the former orders, for the use of open top cars for loading commodities other than coal when moving in the direction of the mines. Also, open top cars less than 38 inches in height are still excluded from the operation of the order and, therefore, such cars may be employed for loading any commodities for shipment to or from the direction of the mines.

By further provision of Service Order No. 15, the railroads are directed to place an embargo against the receipt of any commodity loaded in open top cars suitable for coal lading to any consignee who fails to unload such cars within 24 hours after placement, the embargo to remain effective until all freight thus transported and placed has been unloaded by such consignee.

Service Order No. 17, issued September 17, authorizes the railroads to furnish open top cars to all mines that are able to load within 24 hours, regardless of the method employed in loading. This virtually cancels Service Order No. 14, which denied cars for loading to wagon mines.

Service Order No. 11, giving preference to the movement of coal to tidewater for shipment by vessel to New England, has been suspended indefinitely on account of the improved coal situation in that territory.

Montana Accident Insurance

Chairman A. E. Spriggs of the Montana State Accident Board declares that the employers of the state taking advantage of the opportunity to insure their employes against accidents in industry under Plan 3 of the state law are rapidly increasing. More than 500 employers have been added to the number within the last six months.

Under the plan, the state levies an assessment against the employers embracing the plan to raise a state reserve fund from which compensation for industrial accidents is paid. This assessment is levied each two months and is collected three times a year.

Survey of National Conditions

BY FRANKLIN K. LANE

Franklin K. Lane, former Secretary of the Interior, late in September issued a statement, making public a summary of what he calls "the first comprehensive, carefully-made and approximately accurate picture of industrial, agricultural, financial and political conditions throughout the United States."

It discovers in the foreground, he says, that both major political parties have overlooked the greatest issue in the public mind, which is the cost of living. It also shows, he states, that the country is on a sound economic basis, with the wave of extravagance subsiding, saving increasing, wholesalers and retailers optimistic over the winter outlook, and a growing disposition for hard work, although the individual productivity of labor is not yet showing much evidence of increase.

Mr. Lane's statement summarizes a survey made through 900 field representatives of the Fidelity and Deposit Company of Maryland and covers every section of the country. Manufacturers, merchants, chambers of commerce, bankers, lawyers, business men and farmers were questioned in the effort to mirror the immediate economic and political situation and obtain a consensus of representative opinion as to the future. The replies from all localities were made simultaneously by telegraph.

The following is Mr. Lane's general summary of the information gathered in this survey.

WITH the Presidential election but six weeks away and the winter rapidly approaching, many thoughtful people stand hesitant and undecided, having difficulty because of the general lack of knowledge of business conditions outside their own locality or interests. The general tendency has been to see what the next man thinks, with the uncomfortable feeling that his guess is no better than another's. I believe for this reason, the picture, presented in the tabulated analysis made by the Fidelity and Deposit Company, is of interest to every business man and other voter. While it is not, of course, perfect in detail and exact in prophecy, it is as clear and valuable a conspectus of present conditions as can be gathered.

Economically, the United States is shown to be better off than any other country in the world. There is no evidence of idleness. Our people have the opportunity to work and are at work.

There is no shortage of raw material sufficient to curtail production reported from any of the nine geographical districts into which the country was divided for the purpose of the survey. Only in the district including Minnesota, the Dakotas, Iowa, Kansas, Nebraska and Wisconsin is there evidence of a lack of orders. New England industries report a number of cancellations, but there, as elsewhere, manufacturers are well filled with calls for their products.

Transportation conditions are improving everywhere and a substantial reduction in the freight car shortage is reported in every district except in the Rocky Mountain States, in the Southwest and in the district including Kentucky, Tennessee, Alabama and Mississippi, although an improvement is noted in the latter district.

A shortage of coal and the failure of labor to increase individual productivity appear to be the only two unfavorable aspects in the immediate industrial situation. The Rocky Mountain and Pacific States report a sufficient supply of fuel. All other sections of the country are feeling the shortage, but it is apparently least felt by the South Atlantic States.

Although labor is costing still more than it did last year, it apparently is producing no more. Wages have advanced from 10 to 50 per cent in the last twelve months and yet nowhere

is there reported increase in productivity per man. I am not expecting that the cost of labor will fall off even in the worst of times to its pre-war stage, for I believe that the real differential between directing labor and manual labor will never again be as great as it has been.

So far as the distribution of labor is concerned, the situation nationally appears to be well equalized. A shortage of labor is found only in the Middle and South Atlantic States and this is largely of unskilled workers. In the rest of the country the demand and supply appear balanced. Only in some sections of the Middle Atlantic States is any unemployment reported and this is in certain of the skilled trades, chiefly the building and shipbuilding trades.

An important disclosure of the survey is the seriousness of the housing situation. In many of the larger industrial centres where the shortage has been most acute, the investigation of the Fidelity and Deposit Company has disclosed building operations to be decreasing instead of increasing.

The call for buildings comes loudest from the most essential places of manufacture, rather than from the retail centres, and is for low-priced dwellings. Building construction is increasing in New England, but the bulk of the construction is of factories, warehouses and stores. New York, Pennsylvania and most of the other great industrial states of the East and Middle West show a falling off in building operations. There is improvement in the housing situation in Southern and Pacific Coast industrial centres, with special emphasis on the erection of workmen's homes.

In no section of the country did the investigators find sentiment in favor of government ownership of the railroads, and everywhere better transportation conditions are reported.

Agriculture is generally recognized as the backbone of the country, and the farming situation is excellent; from no section has an unfavorable report been received. Our farmers appear everywhere to be in too happy a mood to permit at this time the cynicism, "the farmer is always grumbling." They are well supplied with funds from the sale of this year's crops, but they are wise in that they know that more favorable marketing conditions can be created.

The recent drop in grain prices is reported to have had no effect except in the Rocky Mountain States. Farmers of Illinois, Indiana, Michigan, Wisconsin and other Central states are withholding grain.

In the financial field, money is tight. That may mean several things: first, that the people want money badly to put into producing activities; second, that the banks attempt to get whatever the traffic will bear, shearing close to the skin; third, that there is an adequate supply of money; or fourth, that those who have money lack confidence.

There are other reasons, no doubt, and among them that as the dollar now buys less than heretofore, people with money wish to charge more for the service that money gives. No one can accurately say which of these causes is the most important factor, but probably all contribute to the present situation.

The telegraphic reports from every section of the country state that the banks are well loaned up, although money is available in the East and Central districts at from six to eight per cent interest. The Southwest, Rocky Mountain and Pacific States report the highest interest rates, averaging from 8 to 10 per cent, and in the Mountain district as high as 12 per cent.

There is great encouragement, however, to be drawn from the fact that in only one of the nine geographical divi-

sions, the Rocky Mountain, has there been a decrease in bank deposits during the last six months. While the general increase includes corporation deposits, individual savings accounts show a more marked improvement everywhere. This seems to show clearly that the orgy of spending and extravagance is over.

Discounting of bills by industrial concerns is universally reported. Except in the Middle Atlantic, Southwestern and Pacific Coast states, manufacturers appear to be carrying large amounts of customers' paper.

The country does not like the present taxation system. The Excess Profits Tax is in bad favor everywhere. Opinion is divided, however, as to a substitute. In the East and Central West, sentiment runs strongly for a sales tax, but elsewhere, opinion as to a substitute is divided.

We are not yet masters of the art of distribution of products. The fact that the farmers uniformly report a desire for some co-operative method by which their products can be brought to consumers means that this problem is of the greatest importance. But it is not for the farmers' benefit primarily that such a movement must quickly culminate in action. The consumer feels that somewhere between the farmer and himself, too much is taken for a service of comparative insignificance in contrast with that which the producer himself renders.

The farmers apparently are not alone in desiring co-operative action. The survey shows opposition to co-operative movements only in the New England and Pacific Coast districts. Sentiment is divided in Ohio, Illinois, and the other North Central Western States, but favorable in the Middle Atlantic, the South Central and the Southern States.

Politically, the replies indicate that it is too early to tell what the outcome of the November election will be. Three months ago, there was a stronger Republican sentiment than there appears to be now. The trend has been, and is, Republican. What it will be in November these gentlemen do not prophesy.

The large outstanding fact developed by the Fidelity and Deposit Company seems to be that the greatest issue in the public mind is being overlooked by the campaigners—the high cost of living. I think this conclusion might well be justified, but the blame should not be cast upon the producer, and certainly the farmer has not received his share of the wealth which he creates.

The cost of living and foreign relations seem to be the main issues. Taxation and industrial relations also occupy a place in the general political thought. Least interest appears to be shown in the railroad policy of the present administration, radical movements, and prohibition.

It is clear that the country is on a sound economic basis, and there is generally a spirit of confidence in the future, regardless of the outcome of the election.

The business outlook appears to be good in every section. Wholesalers and retailers view the fall and winter optimistically. The retailer is finding that the consumer is looking forward without fear to the winter, and his purchases from the wholesaler are founded upon this optimism. From the simple toiler up through the tradesman to the industry and the financier there runs the connected feeling of confidence.

The Sand, Gravel & Supply Company, Macedonia, Ohio, is a new enterprise incorporated under the laws of the state of Ohio recently, having a capitalization of $15,000 and its incorporators being R. J. Anderson, W. E. Gregory, H. A. Kangesser, H. Sharpe and E. C. Sharff.

Making the Rounds

Local Conferences Being Held by Sand and Gravel Officers

A CONSIDERABLE part of September was spent in the Southern States by V. O. Johnston and E. Guy Sutton, president and business manager, respectively, of the National Association of Sand and Gravel Producers. The cities visited include Louisville, Knoxville, Atlanta, Birmingham, Hattiesburg, New Orleans and Memphis.

These visits were a part of the general plan of the officers of this association to cover the entire United States before the next annual meeting. They are very anxious to get in close intimate touch with sand and gravel producers in the various sections of the United States for the purpose of studying the local problems peculiar to each section, and also to unite all sections more closely on the big national problems which the association is working out.

The attendance at each place visited was representative of the majority of the production in the locality, and all those not members of the National Association made application for membership on the spot. Preliminary steps were also taken in each case looking to the formation of local organizations to deal with purely local problems.

Mr. Johnston, in his talks at the various meetings, devoted his attention particularly to local matters, pointing out the function of local associations, their value to the membership, and their relation to the national organization. Mr. Sutton spoke for the most part of specifications, freight rates, and car supply, the big national issues which the association has been pushing so forcefully for some time past.

In the matter of car supply, his declaration that we must re-establish the principle of nondiscrimination was given hearty support among the southern producers.

At New Orleans the officers were invited to come back on October 9 to a meeting at Alexandria, at which time the local committee felt sure that they could have present 90 per cent of the producers of Louisiana and Southern Mississippi. Arrangements have been made to accept this invitation, and hold this joint meeting at Alexandria.

Other meetings in the Southern States will also be held, the schedule for the month being as follows:

October 8—Little Rock, Ark.
October 9—Alexandria, La.
October 11—Houston, Texas.
October 12—San Antonio, Texas.
October 13—Dallas, Texas.
October 14—Muskogee, Okla.

Following these conferences, a series of meetings will be held in some of the Eastern States.

In spite of the many difficulties which have acted to retard construction throughout the year, a greater mileage of hard roads has been completed in Illinois than in any other state up to the present time and it is the hope of the Highway Department to continue this record to the end of the season. At the beginning of this year some 400 miles of road were under contract, having been carried over from 1919, and during the year contracts have been let for about 50 additional miles to complete the federal aid program, for which appropriations had been made. With reasonably favorable conditions from now on it is expected that a total of 250 to 300 miles will be completed this year. In addition to the above work, which has been done entirely on federal aid roads, a great deal of preliminary work, such as grading, renewal of bridges, etc., has been done on the State Aid System in preparation for next year's construction program.

Potash Deposits in Spain

From a Bulletin of the U. S. Geological Survey

By HOYT S. GALE

THE Spanish potash field, as now defined, lies north to northwest of Barcelona, in an area extending approximately from east to west between the towns of Vich and Balaguer. The area thus defined is about 75 miles long, and the claims or concessions, though of irregular shape, form a practically continuous belt with a maximum width between Manresa and Cardona of about 15 to 18 miles.

The principal discoveries of potash have been made in the immediate vicinity of the villages of Cardona and Suria. These places are 40 to 45 miles in a direct line northwest of Barcelona. One of the two main lines of railway between Barcelona and Zaragoza, which are the direct routes between Barcelona and Madrid, is the Ferrocarril del Norte, which skirts the southern border of the potash field. This line runs northward from Barcelona through Sabadell and Tarrasa to Manresa, all important cotton-weaving and manufacturing communities. At Manresa the railway turns west, passing through Lerida. Both Cardona and Suria, where the potash has been found, lie in the valley of Cardoner River and are reached by motor omnibus or "diligence" over an ordinary country road following the river. Manresa is 40 miles by rail from Barcelona, and train service is frequent and satisfactory. Suria is 9 miles and Cardona about 20 miles north of Manresa. A branch railway is now under construction from Manresa to Suria, put in primarily on account of potash developments now going on at Suria.

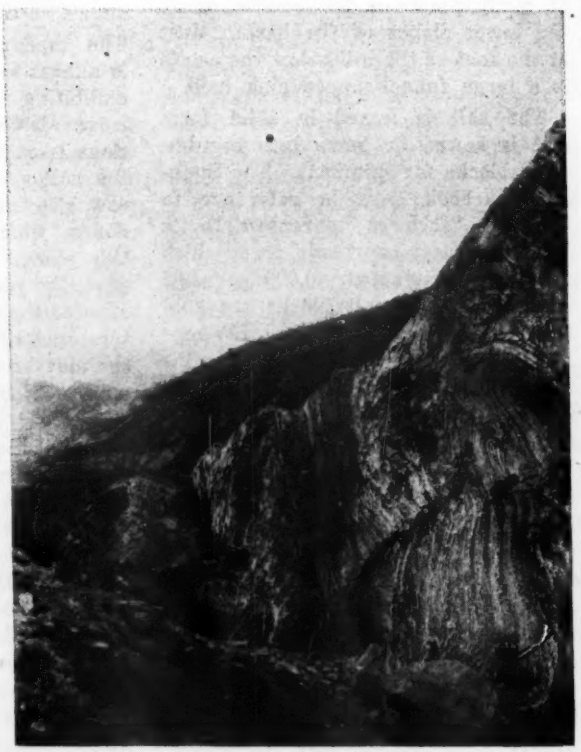
Salt Mountain at Cardona.

A large area of concessions has already been ceded to private claimants by the Spanish Government. After the first rush to appropriate these mineral lands restriction was put on the granting of further rights. A tract reserved by the State is defined as that

included by straight boundaries joining the towns of Vich, Berga, Isona, Balaguer, Tarrega, Igualada, and Manresa. This includes a total area of about 1,800 square miles. Much of this tract is undoubtedly not potash bearing, but it includes in a general way the formations similar to those containing the salts at Cardona and Suria and is a provisionally outlined field reserved for further exploration. An area of 350 to 400 square miles is outlined in the map of concessions already granted. Private interests or foreign governments are invited to participate in the development or operation of the field, under specific regulations of the State and local governments as to manner and regularity of operation and the price and distribution of the product.

"La montaña de sal de Cardona," described by Calderón as a veritable mountain of salt 80 meters high and 4 kilometers in circumference, has been one of the renowned natural features of Catalonia since a very early date. Baedeker says that this phenomenon is mentioned by Strabo, quoting a reference to Book III of his geographic works. The occurrence of mineral salt in Turdetania is mentioned by Strabo also, but this is the region about Cordoba and Cadiz. The mining of salt from the Cardona deposit is a very old industry and is still carried on, both for local consumption and for export. The title to this property is apparently a local hereditary right, recently passed from the Duque de Medinacelli to the Duque de Tarifa.

Cardona (judicial district of Berga, Province of Barcelona) is an old fortified town perched on the summit of an almost isolated hill in a bend of Cardoner River, 600 feet above the river level. The town is surrounded by a wall and dominated at the very summit by an interesting old castle (el castillo). The wagon road encircles the base of the hill and climbs the steep north slope, entering the town through the gate. Trails descend the precipitous south slope from a gate in the wall on the south side. In clear weather there is a wonderful view from the old castle, with Cardoner River stretching away in either direction in the foreground,



Contorted bedding of the salt.

and beyond it, to the north, the distant snow-capped peaks of the Pyrenees. To the south and southwest the town overlooks, at the very foot of the hill on which it is situated, a peculiar depression, which is the salt basin, the "salina de Cardona." At the farther end of this basin is a great whitish-looking scar lying against the mountain side, and this is the famous mountain of salt. It is a great natural outcrop of salt which occurs as an interstratified part of the sedimentary rock section. It is brought to the surface along the crest of a distinct anticlinal fold, the structure of which is perfectly evident in the dip and stratification of the series of sandstones and shales which overlie it and whose outcrops encircle the basin in regular form. Smaller exposures of rock salt occur at many places in the bottom or on the lower slopes of the basin. Just at the foot of the hill below the castle is a large funnel-shaped sink hole.

The salt is mined in solid form and is sawed or hewn into regular-sized blocks for shipment. The Spanish yearbook says in reference to Cardona: "It owes its renown to its famous mountains of salt, from which there are extracted 40,000 quintals annually." The salt blocks are said to be chiefly exported to Africa, where salt is prized in this form. The industry is limited, however, by the cost of transportation. Salt from this source was supplied to the American Army in France during the recent war, and it is said that production was pushed to the capacity of the equipment.

The upper layers of the deposit are a composite of relatively thin bands of variously colored salts and interstratified layers of gypsum and clay. Red and white are the prevailing colors, but there is much gray and some orange or salmon-yellow. These upper salt layers appear in a strangely contorted mass. Under them there is a great compact mass of white transparent salt which is very pure. The salt mined is obtained from the lower layers. According to report, the mining was formerly done in a large, open pit, the salt being cut in steps or terraces, but now it is obtained by underground mining. These workings now have a depth of 50 meters, and the whole depth, it is claimed, is cut in solid salt without the intercalation of any other substance.

The salt basin is the eroded axis of a well-defined anticline. Apparently the massive rock salt is the lowest member of the section exposed by erosion and solution along the axis of this fold. The center of the valley is to a considerable extent covered by detritus of red clay, but the salt shows at the surface in many places. The topographic basin thus formed is almost surrounded by rugged walls exhibiting the dark-red sandstone ledges, which dip outward in all directions from the axis. At the east end the valley opens by a relatively narrow gap into the valley of the Cardoner, which is almost a gorge at this place. The axis of the fold apparently plunges here, but the outcrop of the salts clearly has been intersected by the river channel, where the salt has of course been dissolved away. Singularly, however, the salt is exposed in massive ledges at the base of the hill below the castle, just above the level of the river. The Cardoner is a full-flowing stream of fresh water, and the region is very far from having the appearance of a desert. The river derives its water mainly from the higher mountains to the north, and the rainfall in this particular region must be slight, or so much salt would not be preserved at the surface. A small stream, which is a saturated solution of salts, flows from the salt outcrops down

through the salt basin and enters Cardoner River.

Little seems to be known about the total thickness of the salt beds. The cliff at the head of the salt basin is made up of banded salts in a strangely contorted mass. The convolutions of the bedding of the salt are exhibited by distinct color banding of the salt layers and by the interlaminated seams of clay and gypsum, so that in parts of the mass the display is very fantastic. This contortion illustrates the plasticity of salt under such compression as has been exerted on it in the folding of these rocks. No estimate of the normal thickness of the whole could be obtained from such a mass. Such folding is probably extreme in the axis of the fold and possibly would not extend far on either flank of the simple anticline. The sandstones and interbedded shales that overlie the salt appear to be quite normal and regular at either side of the valley.

The evidence of the existence of potash in the Cardona deposit is not very definite. This may be because of lack of adequate investigation at this locality or the potash may not be present in large amount in this part of the field. As has been said, this exposure gives one of the most favorable opportunities in the field for observation of the general relations of the salt and the overlying beds. It is an epitome of the Spanish field, whether the potash is found in commercial quantity at this locality or not.

Rubio, in his report already referred to, quotes some analysis of samples from both red and white specimens from the Cardona deposit, which shows the existence of very pure chloride of potassium at this locality. He states, however, that these were found only in a small area, and it was said locally that the potash had so far been found only in very thin seams in this deposit. Analysis of the salts in solution in the little brine stream that flows from the big salt cliff is stated to have shown 81.65 grams of potassium chloride per liter of the solution. This seems to be saturation with respect to potassium chloride, but in any solution this depends on the amount and nature of the other salts present, particularly magnesium chloride, the amount of which is not stated in this analysis. The amount of the potash indicated is high in any case. Samples of the rusty-red and white banded salts collected by the writer have given no significant test for potash, and the same is true of a sample of a clear granular salmon-colored salt which is conspicuous in the outcrops.

These samples are, therefore, without special significance of positive value. They show that some of the red and white banded salts so conspicuous in the deposit at Cardona and some of the clear salmon-colored bands are essentially sodium chloride, the red and white salts carrying a little gypsum and insoluble matter.

The value and workability of the potash beds in the Cardona region are therefore still problematic, but there is an excellent prospect at this locality that seems worthy of exploration.

The discovery of potash in the Spanish field was first made at Suria in 1912, by accident. In attempting to open a mine for common salt, at a site where there had been some ancient salt workings, Macary & Viader sunk some borings and a shaft that revealed the potash salts, and it appears that these were very shortly recognized as potash. An investigation carried out in 1913-14 by a French association resulted in the application for and granting of a concession near the village of Suria, which was later enlarged, and concessions in other parts of the field were added to it. This group combined

Outcropping of Potash Salts by the roadside at foot of bluff below old castle, Cardona, Spain.

interest with the Belgian Solvay Co., and the subsequent explorations in the field have been conducted by the Solvay Co., principally in the immediate vicinity of Suria. The discoveries at Suria, of which there are now available only the records of the old shaft sunk for salt, and the borings sunk on the Solvay Co.'s concessions, constitute about the only evidence of the existence of potash in quantity in the Spanish field. These holes have been filled and carefully sealed to prevent damage to the deposit by water, and no new evidence is to be had from them. The records available have been published in the reports of Rubio and Marín already referred to. Such records are difficult to interpret correctly, even when all the evidence concerning them is at hand, but there is no doubt that the existence of potash in considerable masses has been demonstrated.

The valley of Cardoner River broadens in the vicinity of Suria in a way that is very clearly related to the structural geology. The gentle undulations of the strata bordering the valley below Suria give place to a marked flexure with steeply tilted bedding as the town is approached from the south. Sharp folds and an overthrust fault, the axes of which lie directly in the channel of the river or branch from that channel as a center, have brought the lower part of the Tertiary section, including the gypsum and the salts, together with the potash salts, close to the surface. The southern flank of the southern of two anticlines, which is itself a somewhat cross-folded structure, overrides a distinct and regular anticlinal axis to the north. The overthrust on the south is the greater of the two uplifts and would undoubtedly reveal the salt and potash beds in natural out-

crops in much the same way as at Cardona, except that at Suria the river has had much more effective access to the axes of these folds and has naturally dissolved and carried off practically all the evidence of the salt at the surface. The broadening of the valley of Cardoner River at Suria, as also of the valley of its little tributary the Riera de Terdell, is the result of the removal of the salts and the soft shales overlying them through solution and erosion by the river water.

The description of the old shaft sunk for salt and the record that has been published and repeatedly quoted are complete, so far as that evidence goes. This shaft was sunk at the edge of the river-bottom lands, only a few yards above the water level. It is surprising that the strata cut were so impervious that water did not at once filter into the hole, but on the contrary the shaft remained open long enough for the cutting of a cross gallery and the later boring of drill holes to extend the exploration in the bottom and at the end of the gallery. The shaft was subsequently flooded from some unknown cause and has now been filled and sealed.

The Blue Diamond Plaster Company, of Los Angeles, Calif., a few days ago purchased the large plant and properties of the White Star Plaster Company, situated at Arrowhead, near Las Vegas, Nev. The purchase price approximates a quarter million dollars. Additional equipment for $30,000 is being installed, as it is the intention of the new company to double the output of the plant—from 100 to 200 tons per day—expecting to be ready for operations in the near future. This plant covers one section of land containing large deposits of gypsum, and it is said to be one of the largest in the West, the opinion of geologists being that this is the largest deposit of its kind known in Western United States. A sufficient supply of plastering material for local use is assured by the purchase of this tract.

Multiple-Shot Practice

Suggestions for the Arrangement of Churn-Drill Holes

THE arrangement and spacing of drill holes is an extremely variable factor. In most primary blasting, a series of holes are fired simultaneously by electricity. Such a series is termed a "battery of holes" or a "multiple shot" to distinguish it from a "single shot," where only one hole is discharged at a time. For multiple shots the holes are drilled in one or more rows. The distance of the row of holes from the face is termed the "burden," and the distance apart of the holes in the row is termed the "spacing." Where several rows of holes are shot at one time, the burden of the second and following rows is the distance between that row and the next succeeding row toward the face. In some instances the holes of the second and following rows are immediately behind those in the first row. Usually, however, the holes are staggered. Generally better results may be obtained by staggering the holes than by placing them in straight rows.

Difficulty is sometimes experienced in properly measuring the burden from an uneven face. Usually when the burden is heavy the effect of the blast is to shatter and blow out the surface rock for some distance back of the line of drill holes. Such "breakbacks" occur most commonly where the upper beds are unsound or where the charge is placed too high in the drill hole. In placing the next line of holes the burden should not be measured from the edge of this slanting face, because it would obviously be too heavy for the lower part of the face, but should be measured from the position of the previous line of holes. In some quarries where holes are shot in single rows, when one row of holes is completed the burden of the second

row is measured and the positions for the holes marked before the first row is fired. Thus the difficulty of measuring from an uneven face is eliminated.

The burden and spacing of drill holes varies according to the nature of the rock. As a rule, the tougher the rock the closer the spacing should be. If the toughness varies from point to point along a rock ledge the spacing of holes for a multiple shot should be varied accordingly.

In order to determine the proper spacing for drill holes in any particular quarry, one blasting engineer recommends beginning with a close spacing and then gradually increasing the distance until the maximum spacing that will properly shatter the rock is attained. In a 35-foot ledge of moderately hard limestone, drill holes should have a spacing of about 12 feet and a burden of 15 feet. The spacing and burden should increase gradually with increasing depth of holes. Where holes are 100 to 150 feet deep the spacing should rarely exceed 20 feet or the burden 25 feet.

The arrangement of drill holes for typical multiple shots in a number of quarries throughout central and eastern United States is given in the table.

Of the examples in the table, wherever more than one row of holes is employed, the holes are staggered in every instance except one. Some have the holes arranged in three, four, five, or even six rows, in all these the adjacent rows are staggered. Where two rows of holes are used the burden of the second is in some examples equal to that of the first, whereas in others it is less than the first. It is regarded better practice to make the burden for the second and subsequent rows one-half to two-thirds that of the first row.

No attempt is made to judge the relative efficiency of the various arrangements recorded. In fact, to do so would be almost impossible, because the rock varies so widely in different localities that no one method is applicable to all types. Possibly the arrangements shown are not the most efficient that could be used. However, they represent practice at quarries that have been in operation for many years and where various methods have been tried, consequently it may be assumed that a fair degree of efficiency has been attained.

Kind of Rock, Number, Depth, and Arrangement of Churn-Drill Holes for Typical Multiple Shots.

Kind of Rock	Average depth of holes.	Number of holes.	Number of rows.	Opposite or staggered	Burden.	Spacing.
	Feet				Feet	Feet
Cement rock	145	10 to 22	1	.....	20	18
Do	80	3 to 6	1	.....	20	20
Do	85	20	2	Staggered.	18 and 18	18
Limestone	50	50 to 60	1	.....	15	15
Do	30	20 to 30	2	Opposite..	12 and 12	12
Do	22	52	2	Staggered.	10 and 10	12
Do	40	26	1	.....	18	18
Do	55	50	2	Staggered.	15 and 15	15
Do	75	30 to 50	2	Do.....	15 and 14	18
Do	19	41	2	Do.....	8 and 7	12
Do	85	18 to 25	2	Do.....	20 and 5	20
Do	40	10 to 15	1	.....	20	12 to 15
Do	15 to 20	40 to 60	3	Staggered.	8, 5 and 5	7 to 8

The Thew Shovel Company, Lorain, Ohio, announces the establishment of a new office at 510 Railway Exchange Building, Kansas City, Mo. Mr. R. E. Sagaser, formerly sales engineer of the Chicago office, will have charge of the Kansas City office.

Institutional Management for Business

(The second article of a series)

"PRIDE goeth before a fall," is an old saying and a true one. To be proud and haughty is a detriment to anyone, rather than an asset. Yet a man must have a certain amount of pride about his business if he is to be successful. If he has but little pride about his pit or quarry, he can hardly expect his employes to show any pride in it.

It may not be possible for the chance workman, applying for a job, to know personally the operator; yet it is advisable that he know to whom to apply for work, by the use of signs. It is surprising how few quarries and pits ever display signs. These can serve two purposes: first, that of advertising the business to the public—and certainly it is worth while to let all who can read know where they can purchase such products; second, all workmen should know at once for whom they are working.

Any organization or institution desiring to foster any sentiment for itself, must certainly make its name known. Could any business association, such as a sand and gravel society, or a quarry owners' association, attain any prominence, if its name were not known to its membership, or to those whom the association wishes to secure as members? To develop such organizations into really useful institutions, the name is all important, for in this name as the objective point, this sentiment must be centered.

How many pits and quarries are either located on railroads or well-traveled highways, and a large sign conspicuously displaced will become an asset. In some parts of the West, especially in central Ohio, the writer has noticed that even farmers have come to realize the value of such signs for many of them have erected large signboards, giving either the name of their farm or their own name, or both, and the principal product they raise. Such signs must pay these farmers, so there could be little doubt as to the advantage of the same thing for a quarry or pit operator.

Such signs, if the establishment is conducted by a corporation, should bear the name of the corporation, the location of its different plants and the name of at least one officer—either that of the president or of the manager of the local plant—if the same company operates a number of plants.

If the operation is that of a firm, then the firm name should be shown and the name of each individual member of the firm. If there is but one owner, naturally his name should be the one displayed.

With such signs prominently displayed, any workman applying for a job, or working for the organization, would know at once the name, and there is a change that this knowledge would engender a certain pride in his work. It can be seen at once that a business man who is lax in displaying his name, is likely to be lax in many other details of his business. Men will not be furnished the necessary conveniences, nor with comfortable working quarters—nothing in fact, that may attract the men to their employer—save the pay they receive, which can be obtained from any employer.

On the other hand, if an employer shows his interest in his own business by looking after all details, the employes will be quick to detect this and they will realize from the start that they are working for an organization that has certain pride in the business, and this pride will be imparted to the

employes. Only a few days ago the writer was talking to a man who has occupied a subordinate position for more than thirty years. He said he was interested in his work, but naturally took his cue from his superiors. If they showed their interest and devoted their time honestly to their work, he felt their interest and followed their lead with pleasure, but if they neglected their work, and showed but little interest in him and his fellows, he was bound to shirk his duties and do only those things that would get him by with his superiors. Nine hundred and ninety-nine men out of a thousand are like this man.

A business is the means of making money, but it can be made a larger money-maker by building it into an institution that will attract men to it, not only by increasing the sales, but by having loyal workers.

Next to the name of the organization being known, the names of the superior officers should be known. This costs but little, as a few signboards will give this information.

The advantage of making known public officials' names has been shown by the banks of the country. At one time banks had at their banking counters only such signs as "Cashier," "Teller." Now under each title appear the names of the various individuals. On the desk of other officials will be a neat sign, telling the name of each. This has been found a great improvement, as the public likes to know the names of people with whom it is doing business. This is a personal touch which binds people to the institution.

This personal touch, referred to in the first article of this series, in the August issue of PIT AND QUARRY, is needed by every concern doing business.

The office at the plant of a corporation can display a neat signboard as follows:

THE ARUNDEL CO.

J. Blaw .....President
T. Shaw .....Vice-President
R. Brown .....Treasurer
S. Robinson .....Secretary

At this plant.

T. O'Brien .....Superintendent

Purchasing Agent,
R. Clark.

Employment Agent,
P. Hamm.

Time Keeper,
G. Jones.

This will give employes and the public information that will enable business to be transacted promptly and efficiently. If the office consists of more than one room, then the names of persons occupying each room should be shown on each door.

These signs all have a tendency to make the organization using them stand out in a class from others in the same line of business, not using them. It means that they are institutions around which the best sentiment and business principles can be built.

This same principle at small cost, finds a wider application in the business. It frequently becomes necessary for employes to call the attention of the superintendent to things they believe are going wrong, to things that are needed; there will be supplies needed and tools to be repaired, or for any other reason the attention of the superintendent may be required.

Notices should be posted saying who should be seen for the transaction of certain business, and at what hours. Thus from 8 to 9 a. m. the purchasing agent can be seen about ordering new supplies. The superintendent could be seen from 11 to 12 regarding all complaints, salaries, etc. If these officials find it inconvenient at times to be in their offices at the stated hours, then a subordinate could be there and make written memoranda of everything. It is also advisable to encourage men to make such reports and complaints in writing, letting it be understood that attention will be paid only to those which bear the writer's signature. All

of these things mean a closer personal touch and the saving of time over the method of hailing an official wherever one may meet him, thus interfering with other duties, and frequently causing the matter to be forgotten within an hour.

One thing that workmen dread is mistakes in their pay envelope. A notice reading as follows, "In case of errors in pay see Mr. Jones," will facilitate adjustment and preserve the good will of the employes. Mr. Jones' name can be printed, or left blank, so that it can be imprinted on the envelope with a rubber stamp. This is an absolute necessity for a company operating a number of plants widely separated, where a local man at each plant would do the adjusting. Show workmen that you are anxious to adjust mistakes in their pay, and you have gone a long way in winning them.

Most workmen believe that their employers are anxious to cheat them whenever possible, and one reason for thinking so is the difficulty they experience in getting explanations of errors and having them rectified. No one ever seems to have time to attend to them, they are frequently sworn at, at times they are sent from one man to another without receiving any satisfaction. Let an employer who has been underpaid by a customer be treated in the same manner, and he would feel aggrieved as does his employe.

Satisfy men promptly as to their pay and you have again made yourself stand out from others, and you have laid the foundation of the institution that you are desirous of building.

Another way of reaching the men is by means of bulletin boards. On these, notices of all kinds can be posted, so that the men will be advised as to changes in the business management, as to new rules, hours of work and many other details. It is also possible through well-worded circulars posted on these boards to arouse the men's interest and pride in the organization. Then they are led to feel that the interests of employer and employe are identical.

This is in line with the work being done in some large manufacturing concerns that publish a house organ—magazine or pamphlet, weekly or monthly—for circulation among their employes. In nearly every case such organs are more than paying for themselves.

"Safety First" notices and circulars should always be posted. Too much stress cannot be placed upon the care of life and limb. Next to mining, quarrying is one of the most dangerous occupations in the field.

Two ideas regarding labor should ever be before the employer: First, to attract sufficient men into his employ to run his business; and second, to hold all the competent men when once in his employ. The employer has, besides his merchandise, jobs and positions to sell, but unlike the merchandise, he gives money for these, instead of receiving money. The workmen has his labor and service to sell. To drive a mutual bargain there must in some way be an acquaintanceship formed and a mutual understanding. The employer must be the one to take the initiative in this, but must do it with dignity if he is to be successful, and not subject himself to ridicule.

Two serious accidents recently occurred at quarry properties in Virginia. At a limestone plant at Pounding Mill, near Graham, six men were killed by a premature explosion in the limestone crusher at the works. The explosion was caused by the ignition of a fuse by a spark from a drill, setting off three charges of dynamite which were being loaded for later service. A foreman of a prominent road contracting company at Lynchburg, Va., was killed in a quarry on Locke's Mountain by being struck by stone hurled by a blast for rock breaking.

Electrification of Excavating Shovels

THE first excavating shovels of any size to be electrified were put in operation about 1908, being operated by direct-current motors, as it was thought at that time alternating current was not suitable for this application. About 1909 the first shovel with alternating-current motors and control was installed in the quarry of the Kokomo Stone Company, Kokomo, Ind. In the beginning, this shovel gave some trouble due to unsuitable control apparatus, and also to some of the details of the application of the motors to the shovel. After these difficulties were eliminated, and the equipment simplified, the shovel gave satisfactory results and is in operation to date. The simplicity and reliability of the electrical shovel, even in the hands of people entirely unfamiliar with the electrical apparatus, has been amply demonstrated, as no electricians, other than repairmen or wiremen, are employed, the shovels being operated by steam-shovel men. Since this time, a considerable number of shovels, using both alternating-current and direct-current motors, have been installed.

The principal operations of the excavating shovel are: thrusting or crowding, hoisting, and swinging.

By thrusting is meant the operation of forcing the bucket by means of the dipper stock into the bank of material. The thrust or crowding motor is mounted on the boom of the shovel and geared to the main cog-rack of the dipper stock. This operation is not used with the dragline.

Hoisting is the operation of pulling the bucket up through the bank of material. This is done by means of a rope or chain attached to the bucket bail and guided from sheaves at end of boom and back to main hoist drum in the car. The hoist motor is mounted in the main car and geared to a specially designed drum.

The swinging operation swings the boom and bucket, or, in the larger size shovels, the entire car around until the bucket is brought to the dumping position, either on a bank or into a car. It is then reversed and the boom brought back to the loading position, and the whole cycle of thrusting, hoisting, and swinging repeated. The swing motor is located in the car and performs its operations either through a drum and cable or a rack and pinions.

Electric shovels are an evolution of the steam shovel, which has been redesigned in order to take full advantage of the characteristics of the electrical equipment.

In general there are four different ways that are practical for electrifying excavating shovels, which are here briefly described:

Scheme A. By using direct-current motor equipment with rheostatic control, low-voltage, direct-current power being supplied to the shovel through flexible cables from an outside source.

This scheme is very well adapted where the scope of operation is small and direct current is already available. It is particularly well adapted for small quarries and contractors.

Scheme B. By using direct-current motor equipment, low-voltage power being supplied by motor generator or rotaries located on the shovels, operated from power supplied through flexible cables from a 2 or 3 phase alternating-current power system at from 2,000 to 5,000 volts.

If rotary converters are used we are still limited to rheostatic control, but by the use of motor generators

Note—This article is prepared from a recent bulletin of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

these restrictions are removed and it is possible by using a number of d.-c. generators driven by one a.-c. motor to make use of Ward-Leonard or field control, thus eliminating rheostatic losses and securing several desirable operating characteristics.

This scheme offers some advantages on large operations where the source of primary power is very limited or where the power service is very poor, due to poor voltage regulation.

Equipments of this kind may be operated at reduced capacity, even with very poor power supply, with either rheostatic or field control. By the use of the field control system it will be practicable to operate a large electric shovel from a relatively small system without objectionable effect on the voltage regulation. Where there is any doubt as to the capacity or the quality of the power service this system should be investigated before purchasing electric shovels.

Scheme C. By using 2 or 3 phase alternating-current motor equipment with rheostatic control. Low-voltage alternating current being supplied to the shovel by flexible cables from an outside source.

This scheme is well adapted where the scope of operation is small and low-voltage current is already available.

Scheme D. By using 2 or 3 phase alternating-current motor equipment with rheostatic control, low-voltage alternating-current power being supplied from transformers located on the shovel, the transformers being supplied with power through flexible cables at from 2,000 to 5,000 volts.

This scheme offers what is undoubtedly the best solution of the problem on large apparatus with an adequate source of power supply. The apparatus used is simple and rugged and easily understood.

Regardless of which scheme of electrification is used, the control is generally of the unit switch type, except on very small shovels. These unit switches may be either operated by compressed air or by magnets. The air-operated control is the most compact rugged type yet produced and will occupy less space than the magnet type. The unit switches are controlled from small master controllers located conveniently for the operator. These may be arranged so that one operator controls all operation, or for two operators, as desired.

Provision is always made to limit the torque or load on the motor to a safe value in case of stalling in the bank. In the case of the field control outfits this is accomplished by designing the generators and motors to give the proper speed torque combination, while with all equipments using rheostatic control it is accomplished by the use of jamming relays.

The proper equipment to use will depend almost wholly on local conditions, although the rule which will be found best will be, "use the simplest equipment which will perform the required work with the power supply available." There has been a great deal of discussion about the difference in efficiency between the different combinations of electrical apparatus which have been used with excavating shovels. While there is no doubt that such differences exist theoretically, it would be very difficult to make a practical determination of their value. Power costs are a relatively small part of the operating cost of a shovel and will show little difference per yard or ton of material handled, regardless of the type of electrical equipment used.

The Producers' Granite Company, Llano, Tex., recently organized, will operate a works in this district. The company is capitalized at $50,000, and is headed by William Green, J. W. Cearley and Philip Welhausen.

Exact Loading Pays

WE HAVE carried out a number of experiments on overloading, says S. H. Scott in System, and for a period of two months we made our trucks carry all that we could possibly put on them. At the end of this time we obtained two definite results. One was to the effect that we got out orders a little faster than we ever did before and the other was that our repair bills were higher.

This was convincing enough for us. From that time on we have taken pains to see that our trucks carry just the amount of merchandise that they are supposed to carry. We have had some difficulty in doing this, but by using a little device that one of our drivers worked out we have been able to schedule exact loads.

The device that we use consists of a small card, about 3 inches wide and 5 inches long. On this card we write down the tonnage of every one of our trucks, the space available for merchandise on each of these trucks, and the weight of every one of the four articles that we make.

When we begin loading the trucks, an inspector checks off the weight of the articles as they are put in the trucks. He knows how much each article should weigh, but he checks their actual shipping weights to be sure that no mistakes are made. He also tells the drivers how to put the merchandise on the trucks so that every article can be loaded in the least possible time. When the truck is loaded to its full capacity he stamps the card, marks the number of the truck on it and sends it into the office for our truck expense records. If there are any orders left over after the truck is loaded they are put on a small service truck and delivered when the big truck starts out.

We have found that by not overloading the trucks we have been able to cut down our repair bills 32 per cent. Our trucks are never in the shop on account of overloading. The added time it takes to check over the merchandise is negligible beside the factor of reduced repair bills.

New Use for Sand

A car of fine sand every day is the size of an order that the Cudahy Packing Co. has placed with the North Star Concrete Company of Mankato, Minn. The dealer could not understand what this sand was to be used for, and on investigation found an interesting story. J. L. Lang ships hogs occasionally from Mankato. For two years he hasn't lost a hog from heat or broken legs, the result of putting six inches of wet sand in the bottom of each car. No straw is used. Just before loading, the sand is wet thoroughly, which prevents heating and gives hogs a perfect foothold. The Cudahy Packing Co., which has a reloading station at Mankato where hogs are sorted and reshipped to St. Paul or Chicago, lost 14 hogs in shipments made May 3rd, and hearing of Mr. Lang's success, immediately tried his method. Not a hog was lost out of several test carloads. The result was a standing order for sand. What becomes of the sand at destination? Mr. Lang states that the greenhouses and gardeners at points where his hogs are unloaded take all they can get for fertilizer. It has the advantage over straw manure in being ready for instant use and helps to make the soil light.—Universal Dealer.

The Link-Belt Company is now ready to distribute its 32-page book No. 345 entitled "Link-Belt Silent Chain Drives for Cement Mill Equipment." Managers, engineers, superintendents and other officials of cement mills will find it to be a very interesting and valuable book. Copies will gladly be sent on application to the executive offices of the Link-Belt Company, 910 S. Michigan avenue, Chicago, or any of its branch offices.

The Grand Haven Sand Co., Grand Haven, Mich., has increased its capital stock from $2,500 to $50,000.

Loading cars at the plant of the South Ottawa Silica Company.

Simple Sand Producer

New Silica Company Loading Direct From the Pit

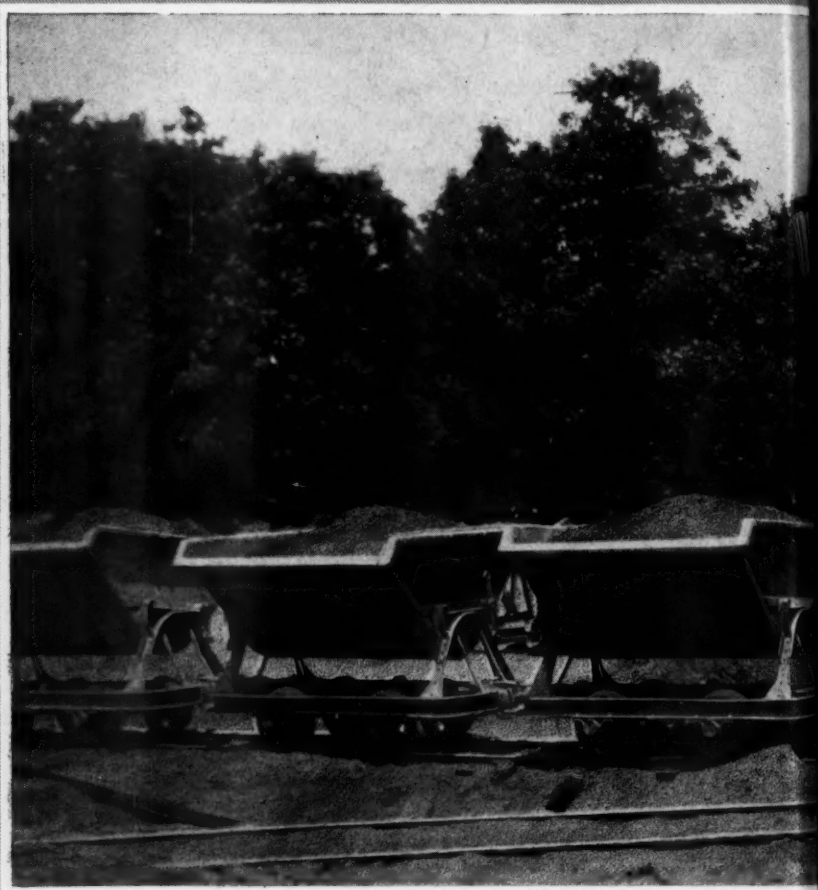
THE South Ottawa Silica Sand Company at Ottawa, Ill., has recently opened a new pit, installed a drag line and a Barber-Greene conveyor, and with this equipment will get to water level—40 feet below ground—in six months time. Occasionally sections will have to be added to the conveyor in order to gain the depth desired, but as the machine is made of standardized units, this is easily accomplished. Already one section of fifteen feet in length has been added, making the whole machine now 95 feet long. The belt is 24 inches wide with troughing carriers.

The drag bucket has a capacity of 4 tons, and as the picture shows, it dumps into the hopper of the conveyor. The hopper was designed by the owner of the plant, F. A. Cebulske. A 15-25 Waterloo Boy tractor drives the belt.

Four men constitute the entire working force. One fires the boiler and operates the drag line, one tops off the car and pinches it along the track, and two help in the feeding of the belt. The sand is somewhat damp and there are often many large bolder-like lumps which have to be broken up. It is possible to do this with a sledge hammer because the mouth of the hopper is covered by a grating made from short sections of an industrial track spaced about 2 inches apart.

A 50-ton car can easily be loaded in an hour's time.

The Greenstone Products Company, Roanoke, Va., has filed notice of increase in its capital from $250 000 to $300,000, for proposed expansion. C. E. Crosby is president.

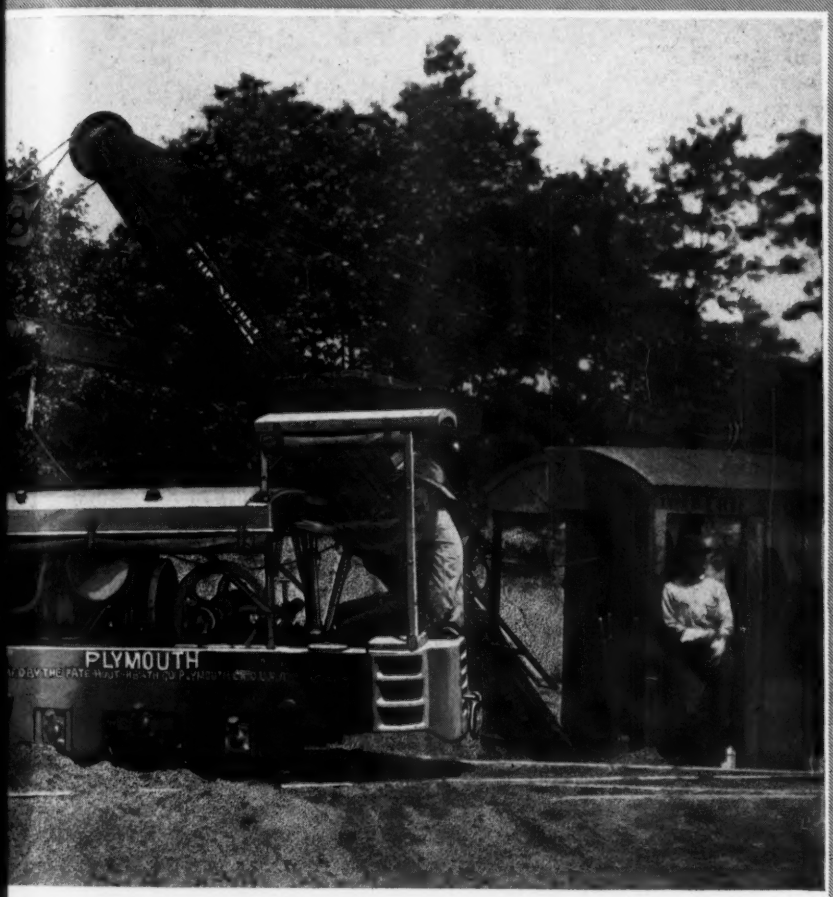


The Plymouth in Pit or Quarry

Putting a Steam Shovel into Pit or Quarry means quantity production.

Quantity production in Pit or Quarry means nothing unless materials can be transported in equal volume.

That's where Plymouth Gasoline Locomotives play a big part. They put a string of empties long side the big shovel and speed away with a surprising load.



PLYMOUTH
Gasoline Locomotives
THE FATE-ROOT-HEATH CO.
206 Riggs Avenue, Plymouth, Ohio

Tracks on three levels at the plant of the Carbon Limestone Co., Hillsville, Pa.

Operating a Quarry on Three Levels

IT TAKES a half-ton of limestone to produce a ton of pigiron. The quarrying of limestone, therefore, has become of importance in the Pittsburgh, Pa., district, second only to that of the steel industry. In fact, the presence of both limestone and coking coal, each necessary in smelting iron ore, has been the chief factor in the development of this famous steel district.

Among the largest of these quarries is that of the Carbon Limestone Company, at Hillsville, Pa., a few miles from Youngstown, Ohio, where a very fine grade of limestone is taken out for use in various blast furnaces of the district. This stone is handled in one-way, side-dump cars, heavily reinforced, which are manufactured by the company in its own shop, under the direction of Mr. Dunbar, car superintendent. The stone runs 90 per cent lime and there is no waste. Screenings, which are not suitable for blast furnace operation, are pulverized and sold for agricultural purposes.

In such an extensive quarry operation as this, stripping is practically continuous. The stone lies from 18 to 40 feet under an overburden of clay and shale, with an intervening layer of coal in places, from which the company is able to mine its own fuel. The Carbon company is doing its own stripping at the present time,

Eight Marion shovels are in use at this plant.

and altogether is operating eight Marion shovels in this quarry, stripping, taking out stone and coal.

A novel feature is the fact that these operations are conducted on three levels. On the floor of the quarry is a narrow gauge track which carries one-way dump cars, loaded with stone. Crossing above this track is a standard gauge track, carrying trains of Western 12-yard dump cars, which are working with the large stripping shovels. In addition to this, stripping is also carried on with a narrow gauge equipment of Western 4-yard cars. These trains cross above the standard gauge track.

About 6,000 yards of overburden are removed each day. F. O. Earnshaw is general superintendent of this important plant. His brother, W. G. Earnshaw, is quarry superintendent.—The Earth Mover.

Explosives for Cement Rock

Extracts from a Bulletin of the Bureau of Mines

By OLIVER BOWLES

THE types of explosives commonly used in quarrying rock for cement manufacture are "straight" nitroglycerin dynamite, ammonia dynamite, gelatin dynamite, low-freezing dynamite, and nitrostarch blasting powder.

Straight nitroglycerin dynamite was in past years commonly employed for primary shots, but recently has given place largely to ammonia dynamite and nitrostarch blasting powder. The compositions of typical explosives of the former type are shown in Table 1.

TABLE 1.—Compositions of 40 per cent and 60 per cent "straight" nitroglycerin dynamites.

Ingredients	40 per cent strength	60 per cent strength
Nitroglycerin	40	60
Wood pulp	15	16
Sodium Nitrate	42	24
Calcium or magnesium carbonates	1	1
	100	100

Ammonia dynamite is now commonly employed. Its tendency to absorb moisture condemns its use in wet quarries. The compositions of typical ammonia dynamites sold in the United States are shown in Table 2.

In quarries where much water is encountered gelatin dynamite has been used with success. Gelatin dynamite contains a small percentage of nitrocellulose, which gelatinizes the nitroglycerin and renders it impervious to water. The compositions of typical gelatin dynamites as sold in the United States are shown in Table 3.

TABLE 2.—Compositions of typical 40 per cent and 60 per cent ammonia dynamites.

Ingredients	40 per cent strength	60 per cent strength
Nitroglycerin	22	35
Ammonium nitrate.....	20	30
SHodium nitrate.....	42	24
Combustible material...	15	10
Calcium carbonate or zinc oxide	1	1
	100	100

TABLE 3.—Compositions of typical 40 per cent and 60 per cent gelatin dynamites.

Ingredients	40 per cent strength	60 per cent strength
Nitroglycerin	33.0	50.0
Nitrocellulose	1.0	1.9
Sodium nitrate.....	52.0	38.1
Combustible material..	13.0	9.0
Calcium carbonate.....	1.0	1.0
	100.0	100.0

Low-freezing dynamites are recommended for blasting in winter. Their freezing point is about 35° Fahrenheit. Other types of explosives may be kept from freezing, or if frozen may be safely thawed by using proper apparatus, but there is still danger that the explosive may become chilled from the air or from the cold rock while being loaded. Compositions of typical

low-freezing dynamites are given in Table 4.

TABLE 4.—Compositions of typical 40 per cent and 60 per cent strength low-freezing dynamites.

Ingredients	40 per cent strength	60 per cent strength
Nitroglycerin	30	45
Nitrosubstitution compounds	10	15
Combustible material	15	16
Sodium nitrate	44	23
Calcium or magnesium carbonate	1	1
	100	100

Nitrostarch blasting powders are used in a number of quarries. They are relatively insensitive to shock and are consequently safer to handle than more sensitive types. The compositions of typical nitrostarch blasting powders used in the United States are given in Table 5.

TABLE 5.—Composition of typical 40 per cent and 60 per cent strength nitrostarch blasting powders

Ingredients	40 per cent strength	60 per cent strength
Nitrostarch	40.0	46.0
Sodium nitrate	52.5	38.5
Ammonium nitrate	3.0	14.0
Sulphur	3.0	...
Oil	0.5	0.5
Chalk	1.0	1.0
	100.0	100.0

Much useful information on the use of explosives in quarrying may be found in Bulletin 80 of the Bureau of Mines.

An important feature of explosives, from the quarryman's viewpoint, is the rate of detonation. Explosives that have a relatively slow rate of detonation, such as the lower grades of nitroglycerin dynamite, tend to push out masses of rock rather than to shatter them, or, in other words, the effect is propulsive rather than disruptive. On the other hand, explosives that have a rapid rate of detonation, such as the higher grades of nitroglycerin dynamite, tend to shatter the rock; that is, their effect is primarily disruptive. In blasting rock for the manufacture of cement, the aim of the quarryman is to break the rock into small pieces, hence the explosive used should have great disruptive force. "Straight" nitroglycerin and gelatin dynamites develop the strongest disruptive force of any of the ordinary explosives available for quarry work.

Gases Evolved by Explosives

Carbon monoxide and hydrogen sulphide are the two most common poisonous gases formed by the detonation of explosives. Hydrogen sulphide can be easily recognized by its strong characteristic odor. Carbon monoxide is invisible and odorless and its effects are swift and deadly. It is, therefore, the most to be feared of all the gases evolved. Carbon monoxide is produced chiefly by the low-freezing and "straight" nitroglycerin dynamites, and hydrogen sulphide by the gelatin dynamites and black blasting powder.

Considerable quantities of the oxides of nitrogen may be formed when the explosive burns rather than detonates. This may occur from the side-spitting of a fuse or through the use of weak detonators. After careful determinations, Mann found that where complete detonation occurs, very small amounts of the oxides of nitrogen are formed.

The fact should be emphasized that when detonation is incomplete, poisonous gases of various kinds are produced in excessive amount. Therefore, greater safety, as well as increased efficiency, is brought about by strong and complete detonation of the charge.

As most quarrying is of the open-pit type, the gases from small blasts can usually escape readily. Where large blasts are fired, however, especially in deep quarries, sometimes too little attention is given to the dangers from the gases evolved. An instance has been recorded of the poisonous gases resulting from a heavy blast causing the death of 7 men and rendering 40 others unconscious. They entered the quarry about one-half hour after the blast had been fired. Obviously, after a large blast, sufficient time should be allowed for the gases

to escape before anyone is permitted to enter the quarry. In any event enough time should be allowed to render the men safe from possible delayed explosions.

In a number of cement-manufacturing localities the rock is mined, and as the blasting is in tunnels the presence of poisonous gases may constitute a grave danger to the workmen. For underground work those explosives should be selected that will break the rock efficiently and at the same time evolve a minimum of poisonous gases. Through experiments conducted by the Bureau of Mines, it was found that the amount of poisonous gases evolved could be decreased by reducing the proportion of combustible material in the explosive and in the paper wrapper containing it. Such a reduction has the effect of increasing the amount of oxygen available for combustion. The tests showed that the proportion of poisonous gases was lowest with gelatin dynamite and may be further reduced by diminishing the content of combustible material, and also by substituting flour for sulphur, wood pulp, or resin in the combustible portion of the explosive. It is recommended, therefore, that for underground blasting a "40 per cent" gelatin dynamite of the following composition be used:

Special Formula for 40 per cent Strength Gelatin Dynamite.

Nitroglycerin	33
Nitrocellulose	1
Sodium nitrate	54
Combustible material	11
Calcium carbonate	1
	100

Where blasting is conducted in confined drifts, the use of a jet of compressed air at the face assists in driving the poisonous gases away. Where work is carried on in several places simultaneously, it is wise for the men, after a blast has been fired, to work for a few hours at another breast and thus allow sufficient time for the gases to escape.

Amount of Explosive for Primary Shots

In proportioning a charge, good judgment should be exercised. The object to be kept in view in blasting is to shatter the rock into reasonably small pieces and at the same time move it as little as possible.

There are several disadvantages in blasting in such a manner that the rock is thrown too far. The most obvious loss in overcharging is the waste of explosive involved. Also, if the rock is scattered far from the face, the cost of loading the scattered fragments is excessive where steam shovels are employed. The disadvantage of overcharging is, in this respect, most pronounced where the face is high.

Moreover, the tracks for cars or steam shovels are usually close to the quarry face. If the tracks are where rock may be thrown on them by the blast, considerable time and labor are required to move them, or, if left in position, to remove obstructions and repair damage caused by flying rock. Furthermore, the danger to the workmen is great where rock is likely to fly long distances.

Good Judgment and Experience Required

Lack of good judgment on the part of a blasting foreman may cause much trouble and annoyance to the men handling the rock. An instance was noted where, through poor judgment, the blasting foreman advised removal of the tracks from the vicinity of the quarry face. When the shot was fired the rock was moved so little that no damage or obstruction would have been caused to the tracks. For a subsequent shot the foreman expressed the opinion that the tracks were in no danger. When the shot was fired they were buried with rock.

Good judgment in determining the amount of explosive necessary is manifested also in the effect produced on

TABLE 6.—Number of Tons of Limestone per foot of Drill Hole for Various Spacings and Burdens.

Burden of drill holes.	Spacing of drill holes, feet.															
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Feet	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
5	2.08	2.52	2.92	3.36	3.78	4.20	....	....	.....	.....	.....	.....	.....	.....	.....	.....
6	2.52	3.02	3.52	4.03	4.53	5.04	5.54	....	.....	.....	.....	.....	.....	.....	.....	.....
7	2.94	3.52	4.11	4.70	5.29	5.88	6.46	7.05	.....	.....	.....	.....	.....	.....	.....	.....
8	3.36	4.03	4.70	5.37	6.04	6.72	7.39	8.06	8.73	.....	.....	.....	.....	.....	.....	.....
9	3.78	4.53	5.29	6.04	6.80	7.56	8.31	9.07	9.82	10.58	.....	.....	.....	.....	.....	.....
10	4.20	5.04	5.88	6.72	7.56	8.40	9.24	10.08	10.92	11.76	12.60	.....	.....	.....	.....	.....
11	....	....	6.46	7.39	8.31	9.24	10.16	11.08	12.01	12.93	13.86	14.78	.....	.....	.....	.....
12	....	....	....	8.06	9.07	10.08	11.08	12.09	13.10	14.11	15.12	16.13	17.13	.....	.....	.....
13	....	....	....	....	9.82	10.92	12.01	13.10	14.19	15.28	16.38	17.47	18.56	19.65	.....	.....
14	....	....	....	....	....	11.76	12.93	14.11	15.28	16.46	17.64	18.81	19.99	21.16	22.34	.....
15	....	....	....	....	....	.....	13.86	15.12	16.38	17.64	18.90	20.16	21.42	22.68	23.94	25.20
16	....	....	....	....	....	.....	.....	16.13	17.47	18.81	20.16	21.50	22.84	24.19	25.53	26.88
17	....	....	....	....	....	.....	.....	.....	18.56	19.99	21.42	22.84	24.27	25.70	27.13	28.56
18	....	....	....	....	....	.....	.....	.....	19.65	21.16	22.68	24.19	25.70	27.21	28.72	30.24
19	....	....	....	....	....	.....	.....	.....	20.74	22.34	23.94	25.53	27.13	28.72	30.32	31.92
20	....	....	....	....	....	.....	.....	.....	.....	23.52	25.20	26.88	28.56	30.24	31.92	33.60
21	....	....	....	....	....	.....	.....	.....	.....	24.69	26.46	28.22	29.98	31.75	33.51	35.28
22	....	....	....	....	....	.....	.....	.....	.....	.....	27.72	29.56	31.41	33.26	35.11	36.96
23	....	....	....	....	....	.....	.....	.....	.....	.....	28.98	30.91	32.84	34.77	36.70	38.64
24	....	....	....	....	....	.....	.....	.....	.....	.....	.....	32.25	34.27	36.28	38.30	40.32
25	....	....	....	....	....	.....	.....	.....	.....	.....	.....	33.60	35.70	37.80	39.90	42.00
26	....	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	37.12	39.31	41.49	43.68
27	....	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	38.55	40.82	43.09	45.36
28	....	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	42.33	44.68	47.04
29	....	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	43.84	46.28	48.72
30	....	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	47.88	50.40

the rock mass. When drill holes in a low bench are loaded too heavy, the blast tends to throw out a trench along the line of holes. When this takes place the rock near the holes is thrown too far and, at the same time, the blast loses much of its effectiveness for shattering the rock farther from the holes. The throwing out of a trench in this manner is known locally as a "chimney" shot. At one quarry visited where an overcharged blast was fired the charge was sufficient to blow out a trench nearly to the bottom of the quarry face, which at that point was 22 feet high. On the other hand, if the holes are loaded too light the rock is insufficiently shattered and much secondary blasting is required.

On a bench less than 30 or 35 feet high the ideal shot thoroughly shatters the mass and moves it but little from its original position. This result is best accomplished by employing the "buffer" method. As a result of such a shot, the mass of shattered rock may, on account of the air spaces formed within it, stand up several feet higher than the face, and is in excellent condition for loading with steam shovels.

Success in loading drill holes depends on good judgment and experience. Experience gained in one locality may not serve for another locality on account of variations in local conditions. Each rock deposit has its own peculiar features, and it is only by long experience that one can become sufficiently familiar with the conditions to attain a high degree of efficiency in blasting.

Calculation of Charge

Mere guesswork in proportioning the charge cannot be too strongly condemned. Many failures of shots are due to the crude methods of determining the amount of explosive used. When churn-drill methods are first tried, a common mistake is to make the burden too heavy. It is then impossible to place enough explosive in the drill holes to effectually shatter the mass of rock blocked out. Blasting in churn-drill holes, as practiced in many quarries at the present time, involves large costs for drilling and explosives for a single shot. Where the cost of one shot may reach several thousands of dollars, failure of the shot results in considerable loss. Success in blasting depends largely on the proper proportioning of the charge, consequently a careful and systematic method of determining the charge should be followed.

The best method is to calculate the tonnage of rock to be moved and to proportion the charge accordingly. The tonnage in short tons may be easily calculated by multiplying together the length, breadth, and height, in feet, of the mass to be moved, multiplying this product by the weight of a cubic foot of the rock, and dividing by 2,000. An average weight per cubic foot of solid limestone is 168 pounds. If a reliable determination has been made of the weight of the rock in any quarry, the figure obtained may be used in place of 168.

If, for example, the length of the mass of rock to be shot down is 200 feet, the width 25 feet, and the height 80 feet, the approximate tonnage would be

$$\frac{200 \times 25 \times 80 \times 168}{2{,}000} = 33{,}600 \text{ tons.}$$

The amount of explosive required for a given tonnage depends on the physical properties of the rock, such as hardness, soundness, the attitude of the beds, and also on the type of explosive employed. As a rule, 1 pound of the explosive ordinarily used in churn-drill holes is sufficient for breaking 4 to 5 tons of rock. An exact figure can be determined only by experience.

Lime as a Potent Factor in Good Tilth

Extracts from a paper before the National Lime Association.

By J. A. SLIPHER,
Assistant Manager Agricultural Department.

Wholly aside from other benefits, lime has the power to improve soils in a physical way. This is a benefit that is too often ignored. Soils well supplied with lime are generally in a good physical condition, while those deficient in that constituent are in poor "tilth."

The exact relation of lime to the physical well being of soils is best revealed by an actual demonstration with fine soil in suspension treated with lime. The minute soil particles have drawn together almost instantly and arranged themselves in fluffy clusters visible to the eye. These groups, being analogous to a single soil particle of equal size (like sand), settle to the bottom, clearing the liquid. The grouping process occurs in the field when lime is added, but more time is required for maximum effect. The resultant condition is friable, loose and mellow—one which every good farmer seeks to obtain. He terms it "good tilth."

We are interested in knowing just how different forms of lime are effective in this capacity. The soils in the cylinders have been variously treated. The first one is without lime. The second one has the addition of calcium oxide, while the third is treated with hydrate, and the fourth with carbonate, all on the practical equivalent basis. It is very obvious as to the relative effects. Oxide and hydrate are identical. The limestone is apparently inactive or at least its action is not immediate. Possibly in time it might exert an appreciable amount of influence; especially would this be true in the presence of decaying organic matter which would release carbonic acid and thus affect the composition of the carbonate, changing it to a form that might be moderately active. This question, however, is one that has not been settled by experiment.

The effect of lime is well demonstrated also by treating soils in a plastic state, and drying the material. A briquet without lime is very hard and cohesive; while one containing the hydrate, has its breaking resistance greatly reduced, indicating that granulation has taken place. Experimental evidence on this point of friability as affected by lime has been obtained at Cornell University. Here again it is to be noted that oxide and hydrate are decidedly potent in reducing the resistance of the soil to manipulation, while the carbonate appears to have exerted no effect within the duration of the experiment. The slightly lesser effect of the hydrate was due to its application being much smaller in quantity than that of the oxide. It should not be concluded, however, that limestone or carbonate has no benefit in this connection, for it does. It can improve the physical make-up of the soil by reason of favoring the growth of legumes which can be utilized to build up the organic content of the soil. This accumulated organic matter in turn has the power to improve the tilth in a manner analogous in effect to lime. This of course is an indirect and slower process.

This matter of creating and maintaining good tilth is vital. Fundamentally, good tilth is the hub of an efficient soil. This is true for several reasons: First, an agricultural soil must be permeable to roots, permitting and inviting their penetration and wide distribution. When seed germinates it is of the greatest importance that the small roots be enabled to penetrate the soil with the minimum of resistance and that the stem may push its way through to the surface with ease. It is under this condition that the young plant can quickly establish itself and begin vigorous growth. Under a soil condition of great density, with a tendence to bake and crust, there can be no hope but for a stunted plant and consequently an inferior yield. Lime fortifies a soil against such a situation.

The second reason why good tilth is vital is that it favors a ready reception of rainfall, an adequate distribution of this moisture in the root zone, and finally it regulates in a large way the subsequent movement of water to the plant roots as well as encouraging a spreading root develop-

ment. Moreover, where an excessive rainfall occurs, the percolation of the excess water is facilitated, relieving the crop of any danger from standing water. The prevention of the baking and crusting over of so-called "heavy" soils, is a problem that is quite wide-spread and one that the farmer is deeply concerned over.

Third, count for good tilth is that an open, friable soil guarantees an ample air supply, which brings with it the oxygen needed for roots, bacteria, and various processes that go on in the soil. Likewise nitrogen from the atmosphere is enabled to enter the soil freely and be utilized by the bacteria. It is not an uncommon sight to see the sad predicament of a crop that is suffering nitrogen starvation as indicated by the greenish-yellow color of the plant. By loosening and opening up soil in this condition, the decay bacteria in the soil are provided with oxygen and are enabled to resume the production of nitrates which the plant is hungering for.

A fourth value of lime on tilth must not be overlooked. Tillage operations are made more effective and at the same time less costly because fewer operations will yield a better seed bed than would a larger number when the soil is untreated with lime.

In England, where lime has been used very extensively, an English farmer has said that he could plow with two horses after liming, whereas before the task required three. At the present time, with the cost of crop production running high, the wisdom of having a soil that lends itself readily to tillage is of prime concern and one that materially affects the net income of the farmer. The good granular condition established by liming is not easily destroyed by heavy rains and other natural forces.

The A. B. C. Sand & Gravel Company, Tulsa, Okla., has been formed with a capital of $10,000, to operate properties in this vicinity. The company is headed by S. J. Wick, C. T. Smith and E. D. Rhodes.

The Great Western Marble Company, Alpine, Tex., recently organized with a capital of $750,000, is planning for extensive operations in this section. J. A. Ferguson is president, and T. A. Caldwell, superintendent.

Lime Committee to Meet

Important Section of A. S. T. M. to Hold Session in Philadelphia

COMMITTEE C-7 of the American Society for Testing Materials, which has in its charge all matters relating to lime, will meet on October 4 and 5 in the rooms of the Society in Philadelphia. Program follows:

Monday, October 4, Subcommittees—
10 A. M. Slaking.
10 A. M. Highways.
10 A. M. Chemical Analysis.
2 P. M. Structural Lime.
2 P. M. Chemical Lime.
2 P. M. Agricultural Lime.
8 P. M. Plasticity.

Tuesday, October 5, 9:30 A. M.—Adjourned Meetings from Monday. 11 A. M.—General Meeting Committee C-7.

The committee comprises representatives of the leading manufacturers of lime, engineering schools of well known universities, American Institute of Architects, State Highway Departments, engineering firms, the Bureau of Standards, the Bureau of Soils, Department of Agriculture, Geological Survey, the Plasterers' Union, Agricultural Experiment Stations, and manufacturers who use lime reactions in their processes.

Important developments along the lines of plasticity, chemical analysis, effects on concrete and specifications for various uses, promise to insure a large attendance.

The Inter-State Portland Cement Company, Des Moines, Iowa, recently was incorporated under the laws of the state of Iowa, authorized capital stock being $3,100,000. Its incorporators are Paul W. Carroll, Parley Sheldon, L. K. Nichols, George Cosson, W. B. Barney and B. F. Carroll, all of Des Moines, where the main office will also be located. Mr. Sheldon is president, Messrs. Nichols and Barney vice-presidents, Paul W. Carroll, secretary and treasurer, Mr. Cosson, general counsel, and chairman of the board of directors is B. F. Carroll. Their articles of incorporation provide for the making of cement, crushed stone, etc.

Looking to the Future

Congress Must Make Appropriations If Road Construction Is to Continue

From Our Washington Correspondent

UNLESS the session of Congress which convenes the first Monday in December makes an appropriation during the next fiscal year for Federal aid in road building the resulting uncertainty as to the future of this work will seriously handicap the states and cause the entire road-building program to suffer a serious setback, according to Thomas H. MacDonald, chief of the Bureau of Public Roads, Department of Agriculture.

In discussing the need of Federal action this year Mr. MacDonald points out that the last installments of Federal aid funds, namely, $100,000,000, became available July 1 last. The actual amount allotted at that time was $97,000,000, a deduction of 3 per cent, or $3,000,000, having been made to provide for expense of administering the act. Of the total apportionment of $100,000,000, the last installment of the 1916 fund amounted to $24,250,000 and the last installment of the 1919 fund amounted to $72,750,000.

When to this is added at least an equal amount of state funds, as required by law if states are to secure Federal aid, funds will be available sufficient to carry the road-construction program forward for the current year, and Mr. MacDonald anticipates that $200,000,000 to $250,000,000 will be spent. But he points out that the states should know at least a year in advance what funds are to be available in order that plans can be made for future construction. When these funds have been taken by the states no other Federal aid will be available unless further appropriations are made.

Discussing the situation as it now exists, Mr. MacDonald says:

"The last apportionment of Federal funds to aid the states in road construction under the existing Federal Aid Act became available July 1, last. This is the largest apportionment yet certified under the Federal Aid Act, amounting to $100,000,000, three-quarters of which is derived from the appropriation of 1919 and $25,000,000 from the original appropriation of 1916. A deduction of $3,000,000, or 3 per cent of the funds, was made to provide for the expense of administering the act by the department. The balance of $97,000,000 was divided among the states in proportion to their population, area and mileage of post roads.

"Under the law states are required to enter into formal agreements with the Secretary of Agriculture for the construction upon which this money is to be used before July 1, 1922. Any money which is not taken up before that time will be reapportioned among all of the states in the same manner in which the original apportionments are made. All previous apportionments have been taken up in the time allotted, and it is not likely that the states will fail to absorb this last apportionment. To do so, however, will mean that the states must survey, plan, and let contracts for at least $200,000,000 worth of Federal aid road construction in the next two years.

"If the states continue to pay more than 50 per cent of the cost, as they have done in the past, the cost of the roads constructed with this last apportionment may reach $250,000,000. In other words, it will be necessary to plan for construction at the rate of at least $100,000,000 and probably more a year. Some appreciation of what that means may be gleaned from the fact that in 1915 the expenditure for all roads in the United States, constructed under state supervision, was

only $80,000,000. Since 1915, however, state highway departments have been greatly expanded and efficient machinery has been developed which will undoubtedly be able to handle the greater volume of work.

"The states have had four years in which to prepare for the expenditure of the large funds which now become available. They expect to be able to handle them. What is of greater concern to them at this time is the condition which may result if Federal appropriations are permitted to lapse. The highway departments should know at least a year in advance what funds are to be available in order that plans may be made for future construction. Unless, therefore, further Federal action is taken in the current fiscal year, the states will be left in doubt as to the future policy of the Government, and the amount of money they must be prepared to expend. Such a contingency would involve a serious setback to the progress of road construction, and should be avoided by early Congressional action."

Price Levels Weakening

General News of the Eastern Field and Its Markets

By Our New York Correspondent

WITH a further recession in construction operations in the eastern sections, a weakness in price levels is noticeable in a number of basic building commodities. Sand, gravel and crushed stone, however, are among the materials holding their own, and there is decided stability in price quotations—incidentally, a decided contrast, too, as compared with common brick, which has dropped from $25.00 to $15.00 a thousand, wholesale, in the New York market, and other construction specialties.

The call for materials is not what it should be by any means, and with dealers well stocked, this branch of trade is awaiting anxiously a revival in demand. With this curtailment in orders, producers for the most part are easing a little in outputs, particularly where good-sized reserves are on hand to care for all immediate business. Labor is more plentiful, and indications in this line are very encouraging.

Improvement continues in the matter of transportation, and while cars in certain parts of the eastern districts are not to be had always in the desired number, yet there is not much cause for the numerous complaints as evidenced in the months gone by.

Crushed stone in the wholesale market holds at $1.90 and $2.00 a cubic yard for 1½-inch material, and at $2.15 for ¾-inch stock. Dealers at New York and vicinity are asking $4.00 a cubic yard for both sizes, delivered on the job. Good sand and gravel are quoted at $1.50 and $3.00 per cubic yard, respectively, in the New York districts; both 1½ and ¾-inch gravel remains at this figure. Dealers are obtaining $4.25, delivered, for first grade washed gravel, while sand is being turned at $2.75 per cubic yard, delivered, by this branch of trade. Cement holds firmly at $5.10 per barrel, the figure as noted in the last issue of PIT AND QUARRY, with a dollar allowance as bag rebate. Building stone ranges from $1.50 to $1.85 per cubic foot, delivered, according to the material, while Dover marble is quoted at $2.25 per cubic foot, and Vermont selections, $3.00. There is a fairly good stone market, but room for considerable improvement.

Owing to the high figures quoted for limestone for municipal projects at New York, hearings have been held under the auspices of the city officials to ascertain conditions surrounding the industry in this section. At one of the meetings late in September,

James McLaren, president of the New York Cut Stone Contractors' Association, testified that this organization includes all of the limestone contractors in the city and metropolitan district, totaling about 45. The members pay $300 as an entrance fee, with yearly dues of $160, while each member is required to pay to the association 1 per cent of his gross business, and which fee becomes due when contracts are signed. This fund, it was pointed out, is needed by the association for the conduct of its business.

Local slate quarries at Monson, Me., are enjoying a "little business boom" and there is a prevailing call for material that is keeping production at a high point. The plants in this district are giving employment to about 250 men. Orders on hand, it is said, will require from six months to a year to fill, and considerable more prospective business is in sight. The big demand and desire for prompt deliveries by purchasers is leading to many express shipments, despite the weight of the material.

The N. Pelaggi Granite Company, Northfield, Vt., is planning for the rebuilding of a one-story granite shed at its works, 60x420 feet, to cost about $30,000.

The Chapman Sand & Gravel Company, Brooklyn, N. Y., has been organized with a capital of $25,000, to operate a sand, gravel and crushed stone business in this section. The company is headed by S. M. Chapman, A. A. Edelman and T. H. J. Sluyter, 1165 Metropolitan Avenue, Brooklyn.

The Alsen Cement Company, Alsen, N. Y., has completed plans for the construction of a new building at its plant, to be used for crushed stone operations, to cost about $20,000.

The Hodgson Sand & Gravel Company, Newark, N. J., has been organized with a capital of $300,000 to operate a sand and gravel plant in northern New Jersey. The company is headed by Clarence Healy and Maximillian M. Stallman, East Orange, N. J.; and Charles W. Weeks, Morristown, N. J.

An accident at the quarry of the Hard Vein Slate Company, Edelman, near Easton, Pa., on September 10, caused the death of three operatives at the plant. The men were working on a ledge, when an unexpected slide carried them into the hole below, carrying water to a considerable depth. The portion of the bank which fell away has not been worked in years, and although fractured, it had been deemed as safe.

The Souder Construction Company, Lancaster, Pa., engaged in the construction of a state highway from Newmans to Fayetteville, has received permission from the Pennsylvania Forestry Department to operate a rock plant on the State land near Caledonia Park. It is proposed to begin operations at once, utilizing the material for the state road service.

The Union Stone Company, Saginaw, near Marietta, Pa., is operating its plant at good capacity, and large shipments are leaving the works. The material is of fine grade and finds a ready market.

The Lehigh Portland Cement Company, Allentown, Pa., has had plans prepared for the erection of a number of plant buildings at New Castle, Pa. Three structures will be built, consisting of a two-story clinker house, two-story storage building, and large power plant for general works service. A new steel and concrete trestle will also be constructed. The work, including equipment, is estimated to cost about $200,000.

The Emanuel Slag Company, Allentown, Pa., is operating its various plants under day and night schedule. The company is experiencing a particularly heavy demand for material, used primarily for road construction work.

The Duquesne Slag Products Company, Pittsburgh, Pa., has filed notice of increase in its capital to $814,000 for proposed expansion.

A little "extra work" was necessitated at the docks of the Rodgers Sand Company, Pittsburgh, Pa., recently by the sinking of two barges of gravel. The steamer was bringing this tow down the Allegheny River when an unmarked scow was struck, causing the barges to sink, the accident happening near Fifty-seventh Street. Work of raising was placed under way at once. The company is particularly active in the vicinity of Cheswick, Pa., at the present time, where a number of sand diggers are at work, and large shipments of sand and gravel are moving to Ambridge.

The Iron City Sand Company, Pittsburgh, Pa., has acquired property totaling about 25 acres in Harrison Township for a consideration of about $22,000, to be used in connection with its operations in this section.

The Parkersburg-Marietta Sand Company, Parkersburg, W. Va., has disposed of two of its gas boats, "David" and "Simpson No. 2" to the Parkersburg Sand Company of the same place. The boats are stern-wheelers, with capacities of about 6 and 8 tons, respectively.

On application of the Silica Sand Producers' Traffic Association of Illinois the Interstate Commerce Commission declared unreasonable the rates on Silica sand from the Ottawa district in northern Illinois to points east of the Indiana-Illinois state line.

The Chatham Oil and Fertilizer Co., Pittsboro, N. C., suffered a $600 loss recently when their big lumber shed caught fire. There was a strong wind, and it was three hours before the fire was under control. 300 bales of linters (owned by the government) and 200 cords of wood were burned.

Delivery Is Resumed

Teamsters Back at Work in St. Louis Building Material Market

SALE of cement, lime and sand, which was discontinued August 4 by the 37 members of the St. Louis Material Dealers' Association on account of a strike of 110 teamsters was resumed Sept. 9.

The warehouses of the companies belonging to the association were closed 36 days, and in that time the city, contractors and individuals requiring cement, lime and sand in the construction were unable to get any from members of the association, although they volunteered to make their own deliveries. Union leaders asserted that dealers had adopted this action as a retaliatory measure directed against the public in order to force a settlement with the teamsters without having to recognize the union.

Following the action of the material dealers, 10 companies operating stone quarries refused to sell crushed rock or building stone.

It is estimated that more than $1,000,000 worth of building work was halted in the city and suburbs as a result of the dealers' refusal to sell cement, and that at least 3,000 building workmen were thrown out of work.

A majority of the members of the Material Dealers' Association were paying the union rate of wages to their teamsters, but the question of unionism came up when representatives of the union asked the dealers to sign a contract with the union, agreeing to recognize the organization and grant them union working conditions and hours. The employers refused to do this. They said that they feared that if they gave in to the union the teamsters, in time, would refuse to haul materials that were not union made.

Waiting for Election Day

California Will Then Know Whether Highway Work Is to Continue

By Our San Francisco Correspondent

SINCE the recent decision of the state highway commission in the state of California to suspend almost all road building, which was forced upon the commission by the tight money market and the provision of the law which precludes the sale of highway bonds below par, the crushed rock industry in this section has suffered considerably. The industry on the Pacific coast depends to a large extent on road building for its activity and all quarries have been affected unfavorably. The general suspension of highway building, however, is not expected to last longer than election day in November, when the voters will determine whether the state shall issue road building bonds at an increased rate of interest in order to get the necessary money in the open market in competition with other issues. If the vote is favorable on this proposition, highway construction will in all likelihood commence with a rush shortly after the election. However, if the vote is against a higher rate of interest for these bond issues, little hope is held out for road work at an early date. There are some exceptions to the general suspension.

According to the weekly report of the county engineer, highway construction throughout the county has been progressing rapidly and much of the contracted work will be finished before the winter.

The Orange Rock and Gravel Company, composed of A. G. Wright, Frank Duff and J. H. Whitaker, the latter as officer manager, has increased its rock crushing plant on the Santiago Creek, near Anaheim in the Southern part of the state, to 200 yards per day.

A deal is reported from Petaluma, whereby E. B. McNear of McNears, Marin county, will lease the Cronin quarries for ten years. A large rock crusher has been in operation at this quarry for a number of years. The new lessee will take possession in February. Three eight-hour shifts are working now to fill orders for rock.

The Bell Marble Company with a large quarry at Columbia, Tuolumne county, has recently estimated their available supply of marble at 25,000,000 cubic feet. One 7-ton truck with a semi trailer is hauling their output a distance of five miles from the quarry to the yards where railroad facilities are available. In a recent statement the president of the company computes that it would require the services of 200 men working daily for 200 years to exhaust their supply of marble which is embedded in the hills.

After being out on strike for two weeks, quarrymen and stonecutters employed at Rocklin, California, by the California Granite Company, have announced that they will return to work. The quarrymen, who were getting $6 a day, demanded an increase to $8. The granite quarry owners then held a meeting in San Francisco and agreed to pay the quarrymen $7. The compromise has been accepted by the workers.

Throughout Washington, Idaho and Oregon, a considerable amount of new highway construction is planned as well as the ordinary repair work on present roads.

The Ideal Moulding Sand Company, Ottawa, Ill., was incorporated on September 14, for doing business in mining sand. The capital stock is $1,000, the larger part of which—$980 being held by Clarence Griggs, while R. I. Thornton and I. M. Martin hold $10 each.

Outlook Appears More Encouraging

Car Supply Is Now the Limiting Factor in Business

By Our Dallas Correspondent

SOMEWHAT more activity in the sand and gravel business about Dallas now than several weeks ago is reported by dealers having headquarters here. This increasing activity is attributed to a resumption of building operations and also to a slightly improved condition in the railway transportation situation. Gravel companies yet report that the business they are doing is limited only by the number of cars available for the transportation of their products.

Much gravel is being delivered by motor truck locally in Dallas and Fort Worth, but continued rains have softened roads and in many instances made gravel pits unworkable, so that this business is not at its best.

Dallas county, which is the largest consumer of gravel in this section, as it is now at work on a road-building program involving the expenditure of $6,500,000, has just settled a controversy involving the engineering work on its roads, and will now proceed with the program without delay. Bids will be asked in a few days for 75,000 cubic yards of pit-run gravel for the Dallas-Denton highway, and about double this amount will be advertised shortly for the Garland Road. About two and one-half miles of concrete is yet to be poured on the Dallas-Fort Worth Pike, and gravel is to be purchased for much of this. In addition to these big contracts, the county has a number of smaller projects and much repair and upkeep work that will require about 150,000 or 200,000 cubic yards of gravel. Most of this will be purchased under contract, although the county has some gravel of its own which is handled by motor truck from pit to job. The county has about a score of large army trucks which have been fitted for gravel hauling and when roads are passable, all these trucks are employed.

There seems to be no change in gravel prices. J. Fred Smith Gravel Company, which contracts gravel only f. o. b. cars at its pits just north of Dallas, is quoting $1.25 to $1.50 a cubic yard for pit run gravel. Some other companies quote gravel as high as $2.25 f. o. b. cars, while gravel delivered by motor truck on the work is quoted as high as $4.50 a cubic yard. The price of gravel delivered varies much, however, being dependent on the length of haul, condition of roads, nature of place of delivery and other factors.

An increasing activity in building operations is noted in Dallas and the demand for gravel delivered on the job is increasing. Many contractors are also operating their own fleet of motor trucks for the delivery of gravel, not depending on gravel dealers for delivery.

Altogether the outlook for the gravel trade in Dallas is more encouraging.

Sand and Gravel at Terre Haute

Unreasonableness was the finding and an order of reparation has been passed in No. 11,107, Summit Sand and Gravel Company et al, opinion No. 6311, 58 I. C. C. 371-2, on shipments of sand and gravel within the switching limits of Terre Haute in the period from June 25 and July 29, due to an error having been crept in in the publication of a tariff. Prior to General Order No. 28, the rates were $4 and $4.50 per car for the different services performed. The men who made up the tariff increased the per car rates to $5 and $5.50 and then added one cent per 100 pounds. Corrected tariffs were issued on July 29, and the reparation is to be made down to the rates subsequently established.

Import Canadian Cement

Making Every Effort to Continue Construction at Buffalo

By our Buffalo Correspondent

SHORTAGE of cement has the Buffalo situation at a standstill as far as the sand and gravel industry is concerned. Good roads work is in a state of coma and street repair work is slowing up. Reports reach local contractors from the cement plants that while there is difficulty in getting cars in which to ship, on top of that they cannot get coal to run the plants to manufacture the cement, it is said.

For the first time in local history contractors and dealers in cement are importing cement from Canada to meet the existing demand. The cement from the Canadian factories is brought to Buffalo by scows crossing Lake Ontario while in the Niagara Falls district, it is being trucked across the border by way of the international bridge at a heavy cost. Fleets of scows are chartered to bring the Canadian product to this city by way of the Welland canal and the lake.

It is reported by local sand and gravel interests that all the cement wished for seems to be available at the Canadian plants and the initial cost is about the same as in this country. However, there is the added cost of duty and the transportation, which makes this practically a prohibitive method for good roads work.

This additional cost and trouble here and the tremendous added cost where it is trucked into the Niagara Falls district, is causing gray hairs for contractors who are bearing the additional expense on contracts already started and which they wish to complete on time. The scow method of getting the cement to the Buffalo district is slower but less expensive than the trucking method by way of Niagara Falls. Most of the trucking in that district is from the cement plants of Port Colborne.

Hope is expressed, however, in that winter is coming in the near future and, with slackening of business, there will be an opportunity for the cement plants to catch up with the demand during the winter season and be in shape to handle the trade again in the spring for the hoped-for boom in building when that season arrives. At present the cement plants are empty of any reserve at all and no dealers have any on hand.

Labor is still rather scarce although much improved over what it was six months ago. In many cases factory production is easing up and in some men are being gradually laid off. It is generally predicted that this will increase and that labor will thus be much more plentiful another season. It is also considered likely by many employers and business heads that this will result in many men being driven back to the farms, with benefits to crop production another year. Wages remain about the same here in the building industry.

Though new building is slow here and throughout this district, a few big plants are under construction and the boom in alterations of single residences into two- and three-family flats, as well as repairs, is holding up strongly.

The matter of housing is just now receiving much attention in Buffalo and if adequate means are taken another year to relieve the acute shortage it will necessarily mean a boom for contractors and to that extent, the sand and gravel industry. For instance, there are approximately 2,500 families living in this city in tenements which do not meet the requirements of the tenement house law. Permission to continue the occupancy

of these houses was granted during the war at the discretion of public officials, because of the acute housing situation, with war plants running full blast. Now the war is over. A speaker at a luncheon of the Buffalo real estate board at the Chamber of Commerce this week, brought out the fact that 2,500 moderate priced homes are needed to replace these illegal tenements.

New industrial plants going up and contemplated, especially in the Black Rock section, make another problem for next season, when homes for fully 10,000 new workmen will be needed. It is pointed out that if homes are not provided and these workmen and their families brought to Buffalo from outside, the new employers will compete with present industries to the demoralization and harm of their employed forces.

It is being suggested that newly built houses might be exempted from taxation and the main problem of all —the money problem—is being considered. It is felt that if the special session of the legislature called by Governor Smith, to consider the housing problem, were to make the mortgage investment field more attractive by letting down the bars to some extent the problem might work itself out by the natural law of supply and demand.

The Hazel-Atlas Glass Company, Wheeling, W. Va., is planning for increased production at its sand properties at Great Cacapon, about 30 miles west of Martinsburg, W. Va. Additional tracts of property have been secured, and a new mine will be opened at an early date, with equipment and production facilities to give employment to about 100 men, or about the same number of operatives as now engaged in this district for the company. The material produced is of fine quality, used in connection with glass manufacture.

Many Louisville Matters

Present Status of Road and Building Work—Car Shortage Felt Keenly

By Our Louisville Correspondent

THE week of Sept. 13 to 18 was State Fair week at Louisville and a feature of the week was the manifestation of a lively interest throughout the state in good roads work. Incident to this there was quite a showing of caterpillar tractors on the fair ground.

Coincident with the recent showing during the fair week in road building the state highway engineer, Jos. S. Boogs, advertised that the State Highway Commission will let a number of state road projects by sealed bids on October 5.

Figures compiled at the closing of the fiscal building year August 31, by the city building department show that notwithstanding home building operations fell short of expectations, the total buildings for the year make a record in point of value. The total value of permits issued during the fiscal year was $7,924,070. This practically doubles the value of any prewar year, which of course, is partly accounted for by increased cost. The figures show plainly that while home building has been rather slow we have had something of an industrial building boom which still continues and which has made for more and better business in sand and gravel than would have been obtained from a greater percentage of home building. Indeed a feature of the present situation is in the industrial building activity which promises to keep the equipment of the sand and gravel people busy right through the fall and early winter season.

As is well known to geologists, we have in this section a great body of shale known as New Albany shale

which is impregnated with oil and from which oil and other products may be obtained by destructive distillation. About once in every so often some one features this fact publicly and there is talk of development. The latest proposition of this kind is by J. H. Pile, of Louisville, with an organization called the No-well Oil Co. which has been demonstrating with a small distilling plant and has plans for opening a quarry and operations in Lincoln county, where there are shale deposits. It is expected to begin operating about January 1 and it is figured that the shale will yield a barrel of oil to the ton.

The continued shortage in cars has served to enlarge and strengthen the interest in trucks for the short haul distribution of sand and gravel and crushed stone and the truck division has easily of late been the active branch of the automobile business. The late Kentucky legislature passed an arbitrary mirror law for trucks requiring equipment with driving seat mirrors obtained from the state tax commission. The Louisville Automobile Club filed suit and obtained a permanent injunction restraining tne state from enforcing the law.

J. E. Lloyd of the E. T. Slider Co. says that they had their shipping trade stocked up as heavily as practical with sand and gravel before the new freight rate went into effect. This was naturally followed by a little slowing down of shipping orders for a while but they are picking up again now and business is moving very nicely. In the local trade, while business is not booming, it is doing very well considering everything, with every indication that there will be a good volume of business right through the fall and early winter.

Lack of transportation has practically killed off the commercial end of the crushed stone business in Kentucky for the time being and reduced quarry operations to local work for roads and to the getting out of railway ballast.

R. B. Tyler, of Louisville, says that he has had to shut down his local quarry and crushing plant for lack of cars. He is operating at Hodgeville, where he has a road contract and transports by truck. His information from other important quarry operators in the state is that their operations are practically limited to railway ballast. And so far as can be seen there is no relief from the car shortage in sight to encourage prospects for fall trade.

Florida Largest Producer of Fuller's Earth

In 1919 the United States produced about 106,000 short tons of fuller's earth, with a total valuation of over $2,000,000, or $18.87 per ton, according to preliminary returns from the producers to the United States Geological Survey, Department of the Interior. These figures show the largest production yet recorded by the Geological Survey, the increase being 217 per cent in quantity and 563 per cent in value in 10 years. As compared with 1918 the increase in quantity during 1919 was 25 per cent, while the year showed an increase in value of 74 per cent. Comparisons of average price per ton for 1918 and 1919 were price per ton for 1918 and 1919 were

Nearly nine-tenths of the total output of 1919 was furnished by Florida, which has for a long time past been predominant in this respect.

The 1919 imports of fuller's earth were 13,873 short tons, with a valuation at the port of shipment of $189,711, or per ton $13.67. In comparison with those of 1918 this shows an increase in quantity of 10 per cent, while the increased value is 15 per cent. An increase of 54 cents per ton for the average price was shown. A comparison of the 1919 imports with those of the period of largest imports, which was in 1914, when a total of 24,977 tons was brought into this country, amounting to $195,083, or $7.81 per ton, shows a decrease of 44 per cent in quantity and a decreased valuation of 3 per cent.

Situation In Indiana

Highway Work Waiting for Cars to Deliver Materials

By Our Indianapolis Correspondent

L. H. WRIGHT, director of the state highway commission, filed an intervening petition with the public service commission, Sept. 7, asking that stone, cement and all other road building material receive consideration in the distribution of open-top freight cars. The petition asks for the same relief for road contractors which was asked by the Indiana Sand and Gravel Producers Association in a petition filed with the commission a week earlier.

Roads now under construction by the state highway department will remain torn up until late next spring unless materials are secured by the contractors, according to the petition.

"During the year 1919," the petition says, "the Indiana state highway commission let contracts for the construction of 135 miles of hard surfaced road, which requires a large amount of sand and gravel, stone, cement and other road material. This mileage is all upon the main highways of our state, and at this time has practically all been graded and is now in such condition that it is impossible for the public to travel over the same.

"Unless the contractors can get some relief by securing cars to ship their material, the greater part of this mileage will remain in this condition through the winter and early spring. If we were given our just proportion of cars, a large part of this mileage will be hard surfaced and the public will benefit thereby.

"In addition to this road mileage, we have let in the neighborhood of $1,000,000 of contracts for bridges, which also require shipment of gravel, sand, stone, cement and steel. Many of these bridges are dangerous and must be taken care of at once in order to protect the public from serious accidents. Other bridges are a part of roads now under contract and should be completed along with the roads."

Objection to railroads in Indiana distributing open-top cars for intrastate traffic on the basis of the interstate commission's service orders, which provide for car service preference to coal mines, has been filed with the Indiana public service commission by the Sand and Gravel Producers' Association.

The sand and gravel interests complain that, while it is all right for the interstate commerce commission to regulate car service for interstate purposes, it is unjust for the railroads to apply to Indiana intrastate traffic the orders which the sand men hold should apply only to interstate traffic. Under the Esch-Cummings act, it is claimed for the interstate commission, the commission has authority to regulate both state and interstate traffic. The question is raised indirectly in the sand and gravel protest, which requests the Indiana commission to see that cars in Indiana are distributed in a more equitable manner from the sand men's point of view.

The petition avers that normally the sand and gravel interests in Indiana ship about 90,000 cars, or more than 4,000,000 tons, a year, 75 per cent of the shipments being for intrastate business. They complain that the coal business is taking so many cars from them that they are suffering heavy losses, and that public work is being delayed.

William Fraunzman, of Ellettsville, Ind., has been named as agent for the Alexander King Stone Company, a Kansas Corporation that has qualified to do business in Indiana. Thirty thousand dollars of its capital is represented in Indiana.

Rock Fertilizer Meet

Various Interests Held a Joint Session in Chicago

A PRELIMINARY meeting of those interested in the use of natural ground or calcined rock materials—lime, rock phosphate, gypsum, potash shales, etc.—as fertilizers, was recently held at the Sherman Hotel, Chicago. The meeting effected a temporary organization with Mr. C. A. Tupper as chairman, and Mr. H. H. Macdonald, secretary of the Gypsum Industries Association, as secretary.

Mr. George Thomson of the Thomson Phosphate Company offered a resolution authorizing the chairman to appoint an executive committee, representative of the interests assembled, to organize and direct the affairs of the group until such time as a permanent organization is effected. The resolution also called for the appointment of committees by the chair on organization, finance, publicity, education, transportation and legislation, to assist the executive committee and to be subject to its control. The resolution was seconded by Claude L. Clark of the National Agricultural Limestone Association and was carried by a unanimous vote of the meeting. The officers and the executive committee are to arrange for a meeting of national scope sometime in late December or early January, at which time a permanent organization is to be effected.

It was the consensus of opinion of the persons assembled that the several rocks mentioned above, along with legume crops as the main source of nitrogen, could be combined into a permanent fertility system that will be cheaper than the present commercial fertilizer system and that will lead to a much greater accumulation of plant foods and organic matter in the soil than is the case with the commercial fertilizer. It was pointed out that such a system would take on more of the nature of permanency.

Besides delegates of the associations and companies directly interested in the manufacture and sale of the rock fertilizer materials, representatives of the following interests were present: agricultural press, trade press, crushing and grinding machinery companies, geologists, mining engineers and soil scientists.

Mr. H. E. Brookby, a chemical engineer and an expert on fertilizer resources of the United States, representing the United States Gypsum Company, gave an address on "The Basis for a Permanent Association of Natural Soil Fertility Resources." This address pointed out the needs and advantages of the proposed Association and the principles on which it should be formed. Mr. Charles F. Henning of the same company discussed this paper giving an excellent tentative plan for the organization of the association.

Dr. William Crocker of the University of Chicago gave an address on "A Natural Rock System of Fertilizers." This address pointed out the successes that have been attained and the principles that have been established in the past and present by the use of various rock fertilizer materials; known possibilities as to the combination of these materials into a permanent fertility system; the desirability of much additional investigation as to the proper use and combinations of these several materials on different soil types and in various crop rotations; and the desirability of the several groups interested working together in an investigational, educational and promotional program.

Mr. Virgil H. Lanier, secretary of the Soft Phosphate Association of Jacksonville, Florida, and Mr. Davis Gray of the Tennessee Agricultural Chemical Corporation of Columbia,

Tennessee, reviewed the rock phosphate activities in their respective fields and pledged their active support to the proposed Association.

Mr. Frank B. White, secretary of the Agricultural Publishers Association, gave a most interesting and important address on the formation and functioning of associations. He spoke of soil fertility and agricultural production as the most important of national questions and offered the new association the assistance and good offices of his Association.

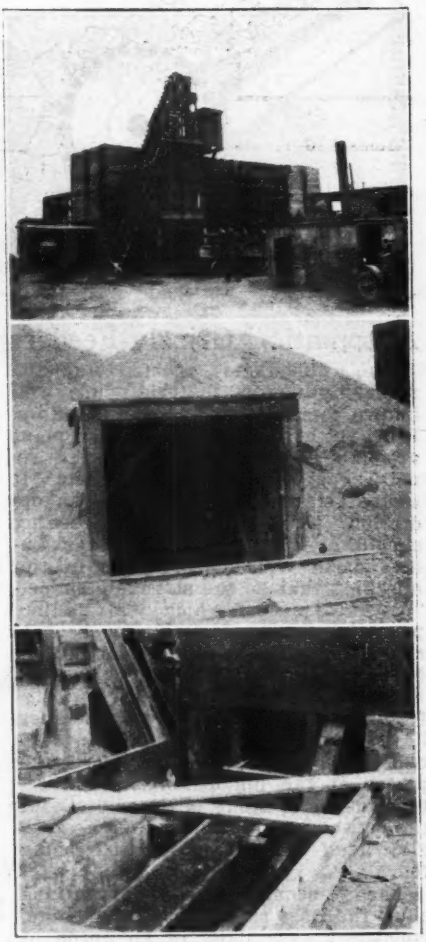
Mr. S. B. Kanowitz of the Raymond Brothers Impact Pulverizer Company discussed the fineness of grinding desirable for various rock fertilizer materials. Mr. Charles A. Weller, mining engineer of the National Barium Corporation, discussed the rock mineral resources of the South Appalachian Mountain System and pointed out how limestone, rock phosphate, gypsum and potash shales were here aggregated, inviting the adoption of a rock fertilizer system for the heavy fertilizer-consuming Southern States. Mr. Philip Miller, Prairie State Fertilizer Company, emphasized the virtue of rock phosphate and the increasing recognition it is receiving in Michigan and other states. Mr. W. Frank McClure, Fort Dearborn National Bank, voiced the interest of his bank in this new movement and the interest of banks generally in furthering American agriculture.

Mr. Wallace R. Harris, International Trade Press, pointed out the ways in which the trade press could help the movement and pledged his support. Mr. E. H. Favor, editor of the American Fruit Grower, discussed the need of fertilizers in fruit growing and expressed his sympathy with the aims of the proposed association.

Various other speakers made suggestions of value in helping the executive and other committees in working up a plan for the permanent organization which is to be presented at the meeting of national scope to be held in December or January.

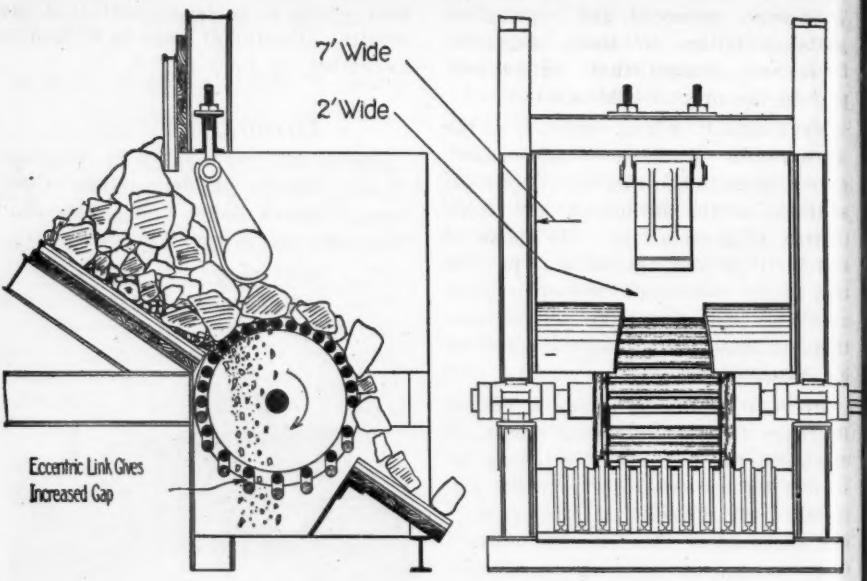
Ground Storage

These snap shots, taken at the plant of the Empire Builders Supply Company, Niagara Falls, N. Y., show that this company is providing against ir



regular car supply and other contingencies, by adequate arrangements for ground storage.

From this storage the material may be delivered direct, or transferred to the bins.



Automatic Grizzly-Feeders

The difficulties of feeding and screening coarse materials are well known to mine and quarry operators. Probably at no other point in a plant are the sledge-hammer and the repair gang so much in evidence. It seems strange that so simple an operation as feeding and screening should give trouble, until one examines closely the usual cause of the mischief, that is, the strangely shaped "neutral" pieces, which will neither pass through the grizzly nor be carried over. This source of trouble has been completely eliminated in the Ross automatic drop-bar grizzly-feeders. In addition, these machines have overcome other well-known difficulties, such as the blocking of large pieces at the bin-opening, and irregular rushes of stone in the chute with the consequent inefficiency of the grizzley itself and of the machine being fed.

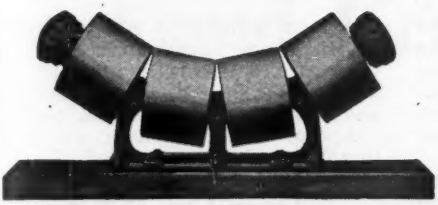
The accompanying illustrations show the Ross rotary type of machine, consisting essentially of an apron of equally spaced bars, which are fed forward under the lip of the bin-opening. The quantity of stone drawn away is determined by the speed of the moving bars and the relative position of the heavy flexible door. The main bin-opening is made quite large, and when a big piece comes through the gate it will swing outward temporarily to allow it to pass, returning afterward to its normal position. On reaching the discharge point, each alternate grizzly-bar drops, remaining clear during the return half of the cycle, at the end of which it automatically comes into position, ready again for the operation of screening and feeding. All trapped pieces are thus released and discharged without delay. On their return trip to the starting point, the bars do not obstruct the free passage of the fines.

This grizzly is manufactured and sold by the Ross Engineering Company, Old Colony Building, Chicago.

Thew Changes Name

The Thew Shovel Company, an Ohio corporation with offices at Lorain, Ohio, announces that it has taken over the property and business, and has assumed all legal liabilities and obligations of The Thew Automatic Shovel Company. The new company will operate with increased capital resources and manufacturing facilities. The officers of the new company are: F. A. Smythe, President; H. H. Harris, Vice-President; A. B. Taylor, Vice-President; C. B. Smythe, Secretary; R. B. Miller, Treasurer; H. E. Billington, Manager of Sales; J. S. Small, General Works Manager; H. B. Newton, Purchasing Agent.

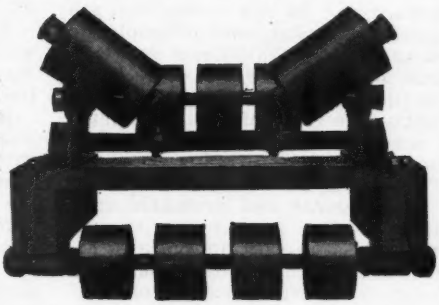
CALDWELL CONVEYORS

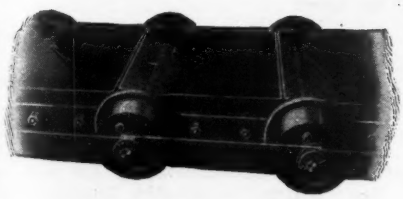


BELT CONVEYORS

Simple in design, economical of power, they give satisfaction. Different styles to suit your requirements.

A rough sketch showing conditions to be met at your plant, with capacity desired and power available, will bring our recommendations.





APRON OR PAN CONVEYORS

Flights or pans made of steel or cast iron, fitted to steel bushed self-oiling roller chain — complete with drives.

SCREW CONVEYORS

Steel "HELICOID" or Sectional flight screw conveyor for washing plants. We also make cast iron Screw Conveyors.

See Catalogue No. 38 for complete line of

Elevating, Conveying and Power Transmitting Machinery

H. W. CALDWELL & SON COMPANY
CHICAGO
Western Avenue, 17th and 18th Streets

New Lime Trade Bulletins

Under the title of "Equivalent Strength of Liming Materials" appears a new trade bulletin, No. 101 of the Agricultural Department, National Lime Association. It describes the several market forms of agricultural limes with reference to theoretical composition, physical properties, and practical relative strengths as ordinarily found on the market. Special attention is given to properties affecting their availability in the soil such as fineness and chemical form.

The interrelation between concentration of liming material and economy is touched on. In this connection, are set forth the fundamental principles to be observed in an intelligent selection of lime for use on the soil. The bulletin is illustrated by chart and carries a frontispiece of significant meaning.

A second trade bulletin, No. 103, "Beneficial Effects of Lime on the Soil" treats of the relation of lime to soil improvement and profitable crop production. The role of lime in successful legume growth, its office in organic matter and nitrogen building, stimulation of nitrate production, regulation of organic decay, its good effect on availability of phosphorus, and its power to develop and maintain superior soil tilth are presented in alignment with scientific facts and good field practice.

Illustrations supplement the more important parts of the text matter.

Organized New Company

Edward R. Dawson announces that he has severed all connections with the Victor-Balata and Textile Belting Company, and has organized the Dawson Belting Company, with main offices at 253 Broadway, New York City, with Eastern warehouse at Building 29, Bush Terminal, Brooklyn, N. Y., where he is carrying large and complete stocks of Balata, canvas stitched and solid woven beltings.

It is reported from New York that the market is fairly overrun with export agents trying gto obtain American cement for foreign markets. In August the total cement exports amounted to 700,000 barrels more than was shipped out of this country in August of last year, the record for last month being 1,645,000 barrels as against 930,000 barrels a year ago.

Erie Shovel Bulletin

The Ball Engine Company, Erie, Pa., recently issued a new bulletin, "S-16," giving a general description of the Type B Erie shovel, and at the same time going into fairly complete details.

A large number of illustrations are shown of the shovel in actual operation, also detailed illustrations, with a view to showing the construction and working of the various parts.

A copy of this bulletin wil be sent to anyone who is interested.

Open-Cut Mining

A catalog which it will be worth while to have is that of the Hamilton Manufacturing Company, 310 Schultz Building, Columbus, Ohio.

It illustrates and describes the Hamilton stripping and conveying machine, which has been designed particularly to simplify and economize the operation of stripping the overburden from mineral deposits, making it possible in some cases to do mining by the "open cut" method, where underground methods would ordinarily be used.

"Beg Your Pardon!"

Charles Tyler, recently appointed district sales engineer at Chicago for the Easton Car & Construction Co., advises us that we have twice given incorrectly the location of his new office, which is at 654 Railway Exchange, Chicago.

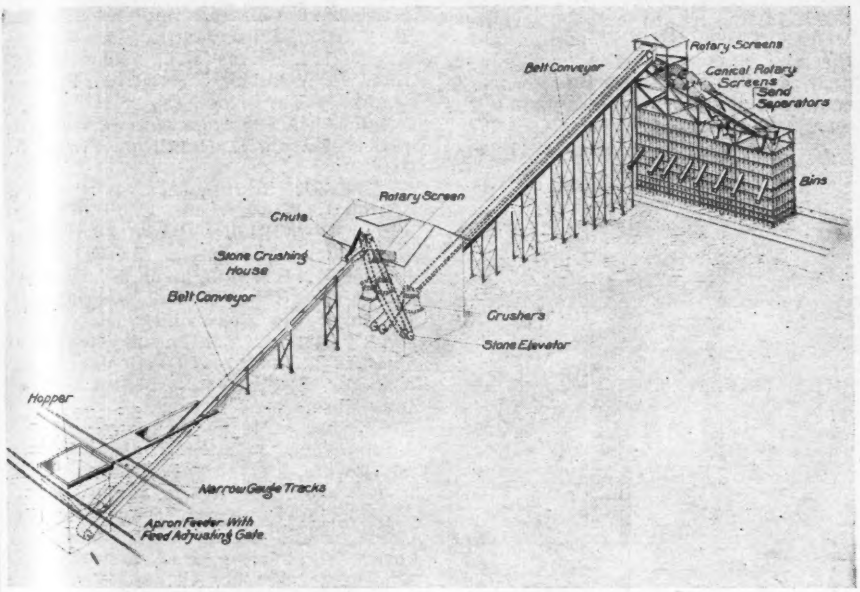
Jeffrey Office in Buffalo

In order to render more efficient service and to obtain close co-operation with their customers in western New York, the Jeffrey Manufacturing Company, Columbus, O., have opened a new branch office in Buffalo, at 1108 Marine Trust Bldg. Mr. H. W. Scott, formerly of the home office, will have charge.

Mr. Scott's long and successful experience in sales and engineering work for the Jeffrey Company, enables him particularly to take care of the constantly growing demand for Jeffrey products in his territory, and to render valuable assistance to clients, in dealing with problems concerning elevating, conveying, crushing, pulverizing, portable loading machinery, etc.

LINK-BELT

Sand and Gravel Plants



Typical Link-Belt Sand and Gravel Washing Plant

Each Link-Belt Sand and Gravel plant is built to secure the greatest commercial advantages for its owners—whether the desired output be 10 or 300 carloads a day.

Each plant has its individuality, and the details of design make it the most efficient for its work, from every standpoint—economy of operation—high quality of material — simplicity — durability, etc.

Link-Belt Screens, scrubbers, sand separators, excavators, spouts, gates, feeders, water pans, belt conveyors, bucket elevators, etc., are features of Link-Belt plants that earn dividends for their users. If you contemplate additions to, or changes in your present equipment, or a new plant, why not put your problem up to our engineers?

Send for catalog

LINK-BELT COMPANY

Chicago, 329 W. 39th Street — **Philadelphia, Hunting Park Ave., and P & R Ry.**

OFFICES IN ALL PRINCIPAL CITIES

New Air Drill

The Denver Rock Drill Manufacturing Company, Denver, Colo., has recently developed a new type of light mining and quarrying drill which, it is claimed, marks an advance in the progress of air drill manufacture that has seldom been equalled by any single achievement.

This new type or drill is built in three models, known respectively as Models NA-90, NRW-93 and NRD-95; the first named being a "dry" auger drill, especially designed for work in coal, iron and soft formations; the second, a combination "wet" and "dry"

rock drill efficiently serviceable in all kinds of rock and under all conditions either above or below ground; and the last named a "dry" rock drill particularly adapted to work in wet shafts or where out-of-door conditions prevail.

All three drills are extremely light, so that they can be easily carried about, and each is operated by one man alone.

While most Waugh drills are of the valveless type, the "Nineties" are equipped with an entirely new type of spool valve, having a positive action.

Lubrication is effected by pulsations of air which gradually feed the oil from a reservoir at the side of the cylinder into all parts of the machine.

The Ohio and Michigan Sand Co., Toledo, Ohio, has increased its capital stock from $25,000 to $150,000.

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trademark attorney, Continental Trust Building, Washington, D. C., at the rate of 2c each. State number of patent and name of inventor when ordering.

1,349,641. Mining implement. Ivan B. Wathen, Strattonville, Pa.

1,350,124. Excavating-bucket. William M. Venable, Pittsburgh, Pa., assignor to Blaw-Knox Co.

1,350,154. Sand-separating apparatus. Harold L. Hamilton, Fargo, N. Dak.

1,350,691. Sliding base for grinders. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher & Pulverizer Co., same place.

1,350,706. Mining-machine. Charles E. Davis, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1 350,748. Crushing-roll machine. Thomas J. Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co., Boston, Mass.

1,350,992. Means for leveling and staying excavating-machines. Robert M. Downie, Beaver Falls, Pa., assignor to Keystone Driller Co., same place.

1,351,114. Dump-car. Ortus E. Moats, Chicago, and James D. Benbow, Aurora, Ill., assignors to Western Wheel Scraper Co., Aurora, Ill.

1,351,212. Excavating-machine. James A. MacKillican and Frank L. Lipcsey, Hibbing, Minn.

1 351,234. Separator for the treatment of coal, clays, ores, and the like. John M. Draper, Bridgend, England.

1,351 563. Adjustable-bar coal-screen. James C. Gaskill, Fairmont, W. Va.

1,351,791. Gathering conveyor-bucket. Herbert W. Sargent, Fort Dodge, Iowa, assignor to Sargent Tile Ditcher Co., same place.

1,351,791. Mining-machine. Albert Ball, Claremont, N. H., assignor to Jeffrey Mfg. Co., Columbus, Ohio.

1,352,428. Rock-Drill. Harry M. Chase, Denver, Colo., assignor to Denver Rock Drill Mfg. Co., same place.

1,352,609. Coal-crusher, Myron A. Kendall, Aurora, Ill., assignor to Stephens-Adamson Mfg. Co., same place.

1,352,653. Mine-haul. Herbert V. Brown, Cherry Tree Borough, Pa.

1,352 797. Crushing-machine. William Elik, Pittsburgh, Pa.